Salmon Research Operational Plans

for the Kodiak Area, 2002

By

Westward Region Finfish Research Staff

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Alaska Department of Fish and Game
Division of Commercial Fisheries
211 Mission Road
Kodiak, AK 99615

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INTRODUCTION

The Kodiak Management Area (KMA), located in the Gulf of Alaska, extends from Cape Douglas to Kilokak Rocks and includes Shelikof Strait and the waters of Kodiak, Afognak, and Shuyak Islands (Figure 1). The KMA is divided into seven districts and 56 sections that include over 440 known salmon streams (Figures 2-6).

Of the five Pacific salmon species harvested in the KMA, sockeye salmon are currently the most economically important followed by pink, chum, coho, and chinook salmon. The Alaska Department of Fish and Game (ADF&G) assumed the responsibility of managing Alaska's salmon resources in 1960. The emphasis of the salmon management program since that time has been to achieve biological escapement goals, maximize the quality and quantity of harvest in an orderly manner, and adhere to the Alaska Board of Fisheries adopted management plans (Brennan et al. 2001).

The 2001 salmon harvest, totaling 23,711,965 fish, was composed of 23,827 chinook, 2,659,267 sockeye, 407,978 coho, 19,567,163 pink, and 1,053,730 chum salmon (Brennan 2001). The 2002 harvest is projected to be approximately 14,400,000 salmon consisting of 20,000 chinook salmon, 2,230,000 sockeye, 367,000 coho, 11,000,000 pink, and 778,000 chum (Eggers 2002).

Assignment of salmon catch to river system of origin is a prerequisite for evaluatimg escapement objectives and forecasting returns. In 1985 an expanded commercial salmon catch sampling operation was initiated in the KMA to establish a database that would help determine stock contribution levels, evaluate escapement goals, and estimate preseason forecasts. This program has continued with the current emphasis on sockeye salmon. Stock identification projects using scale pattern analysis (SPA), as well as age marker analysis, have been conducted within the Afognak, Northwest Kodiak, Southwest Kodiak, Alitak Bay, and Mainland Districts and may continue in 2002.

GOAL

Provide data from the commercial salmon harvest to assist with the long-term management of the KMA sockeye salmon runs.

OBJECTIVES

Provide specific data, derived from sampling of the commercial catch of salmon, that will facilitate:

1. Construction of accurate brood tables.
2. Development of accurate run forecasts.
3. Evaluation of escapement goals and run timing.

4. Addressing mixed stock fishery issues and annual run reconstruction projects through scale pattern analysis (SPA) and age marker analysis.

TASK

Collect samples of scales (for age determination and SPA) from selected sockeye salmon fisheries.

SUPERVISION

Department research biologist Matt Foster will supervise the 2002 KMA salmon catch sampling program and monitor weekly catch sampling, and review incoming data for quality, quantity, and timeliness. A logbook will be maintained, tracking all weekly samples, and catch sampling crewmembers will be notified periodically regarding data quality.

Personnel assignments at the Port of Kodiak and Lazy Bay (Alitak) will be made throughout the season based upon logistics. The KMA salmon catch sampling crew members are listed in Table 1. Available permanent and seasonal staff will assist in catch sampling at the Port of Kodiak when necessary.

PROCEDURES

The standard procedures for collecting and recording salmon age data are defined in Appendix A. The accuracy of the data and scale sample quality will be the responsibility of each crew leader. If questions or problems arise, do not hesitate to ask your supervisor for clarification or assistance.

Sockeye salmon catches will be sampled for age (scales) by the KMA salmon catch sampling crews according to the sampling schedule provided in Table 2. To ensure that sockeye salmon samples are obtained, the crews will begin sampling on the first day of delivery during the designated sampling sample week (Appendix A.1). Each crew leader should review the 2002 Kodiak Commercial Salmon Fishery Harvest Strategy (Brennan et al. *In press*) and become familiar with the basic management chronology and terminology.

All catch sampling data are to be representative and random. Deliveries which contain fish harvested from non-targeted areas and deliveries containing loads of mixed origin (< 90% pure) are not to be sampled. There will be no pre-selection of fish for length, sex, condition, or any other factor.

The sample size per catch sample is 400 fish, which assumes a conservative estimate of at least 88.5% of the scales to be readable. The sample size was constructed to permit each age class proportion to be estimated within 0.06 of the true proportion with 95% confidence, regardless of number of age classes or population proportions (Thompson 1987). A sample size of 600 will be utilized for Cape Alitak and Moser-Olga Sections to ensure that the minimum sample size per age class will be available for SPA.

Scale samples collected by the crew in Kodiak will be pressed onto acetate cards and aged on a weekly basis. The original scale "gum" cards and opscan forms will be hand delivered to the Kodiak office at the end of each sampling trip. All correspondence should be directed to Matt Foster. When catch samplers are sampling at remote locations (e.g., Alitak) they will report to Matt Foster by phone on a daily basis; alternatively, correspondence should be directed to Mark Witteveen. The Port of Kodiak crew will be responsible for pressing and aging all remaining sockeye salmon scale samples (including escapement), updating the weekly sampling log, and cataloging all catch and escapement sampling data. Only those personnel passing the 2002 Westward Region scale-aging test will age the samples.

Data from both the catch and escapement samples in 2002 will be compiled and reported by Mark Witteveen and Matt Foster in the 2002 Kodiak Management Area Catch and Escapement Sampling Results report that will be published in January of 2003.

LITERATURE CITED

Brennan, K. 2001 Kodiak Management Area Commercial Salmon Annual Management Report. Alaska Department of Fish and Game, Commercial Fisheries Division, Regional Information Report No. 4K01-62, Kodiak

Brennan, K., D. Gretsch, and J. Wadle. 2001 Kodiak Commercial Salmon Fishery Harvest Strategy for the 2001 season. Alaska Department of Fish and Game, Commercial Fisheries Division, Regional Information Report No. 4K01-35, Kodiak.

Brennan, K., D. Gretsch, and J. Wadle *In press.* Kodiak Commercial Salmon Fishery Harvest Strategy for the 2002 season. Alaska Department of Fish and Game, Commercial Fisheries Division, Regional Information Report No. 4K02-XX, Kodiak.

Eggers, D.M. 2002. Run forecasts and harvest projections for 2002 Alaska salmon fisheries and review of the 2001 season: the short version. Alaska Department of Fish and Game, Commercial Fisheries Division, Regional Information Report No. 5J02-01, Juneau.

Thompson, S. K. 1987. Sample size for estimating multinomial proportions. The American Statistician. 41: 42-46.

Table 1. Kodiak Management Area salmon catch sampling crew, 2002.

Name	Title	PCN	Position	Period
Matt Foster	FB II	11-1118	Supervisor	Perm.
Ani Thomas	FT III	11-5309	Crew Leader	6/01 - 8/15
Krysta Williams	FT II	11-1836	Crew	6/01 - 8/15
Alexia Kinsley	FT I	11-1479	Crew	6/01 - 8/15

Table 2. Sockeye salmon catch sampling schedule for the Kodiak Management Area, 2002.

District Geographic Area	Statistical Area	Primary Sampling Site [a]	Crew Leader	Sample Frequency	Sample Dates	Sample Size
Afognak District						
NW Afognak Section	251-30 - 251-50	Port of Kodiak	Foster	weekly	7/6 - 7/25	400
Waterfall Bay THA	251-84	Waterfall Bay	Swanson	intermittently	6/9 - 7/1	400
Foul Bay THA	251-41	Foul Bay	Vacant	intermittently	6/9 - 7/1	400
SW Afognak Section	251-10 - 251-20	Port of Kodiak	Foster	weekly	6/14 - 8/31	400
Malina Bay THA	251-20	Malina Bay	Spalinger	intermittently	6/5-6/30	400
Kitoi Bay	252-32	Kitoi Bay	Ghormley	intermittently	6/1-8/1	400
NW Kodiak District						
Uganik Bay	253-11 - 253-35	Port of Kodiak	Foster	weekly	6/9 - 9/5	400
Uyak Bay	254-10 - 254-40	Port of Kodiak	Foster	weekly	6/9 - 9/5	400
Telrod Cove/Spiridon	254-50	Telrod Cove	Watchers	weekly	7/19 - 9/12	240
SW Kodiak District						
Inner/Outer Karluk Section	255-10 - 255-20	Port of Kodiak	Foster	weekly	6/9 - 8/1	400
Sturgeon Section	256-40	Port of Kodiak	Foster	weekly	6/9 - 8/1	400
Halibut/Gurney Bay	256-25 - 256-30	Port of Kodiak	Foster	weekly	6/23 - 8/1	400
Inner/Outer Ayakulik Section	256-10 - 256-20	Port of Kodiak	Foster	weekly	6/9 - 8/1	400
Alitak Bay District						
Cape Alitak/Humpy Deadman	257-10,20 257-50-70	Alitak	Costello	weekly	6/9 - 8/31	600
Moser/Olga Bay	257-40 - 257-43	Alitak	Foster	weekly	6/9 - 8/31	600

[a] Alitak is the secondary sampling site for SW Kodiak samples.

[b] Telrod Cove will use a weekly sample size of 240 fish (consistent with escapement sampling).

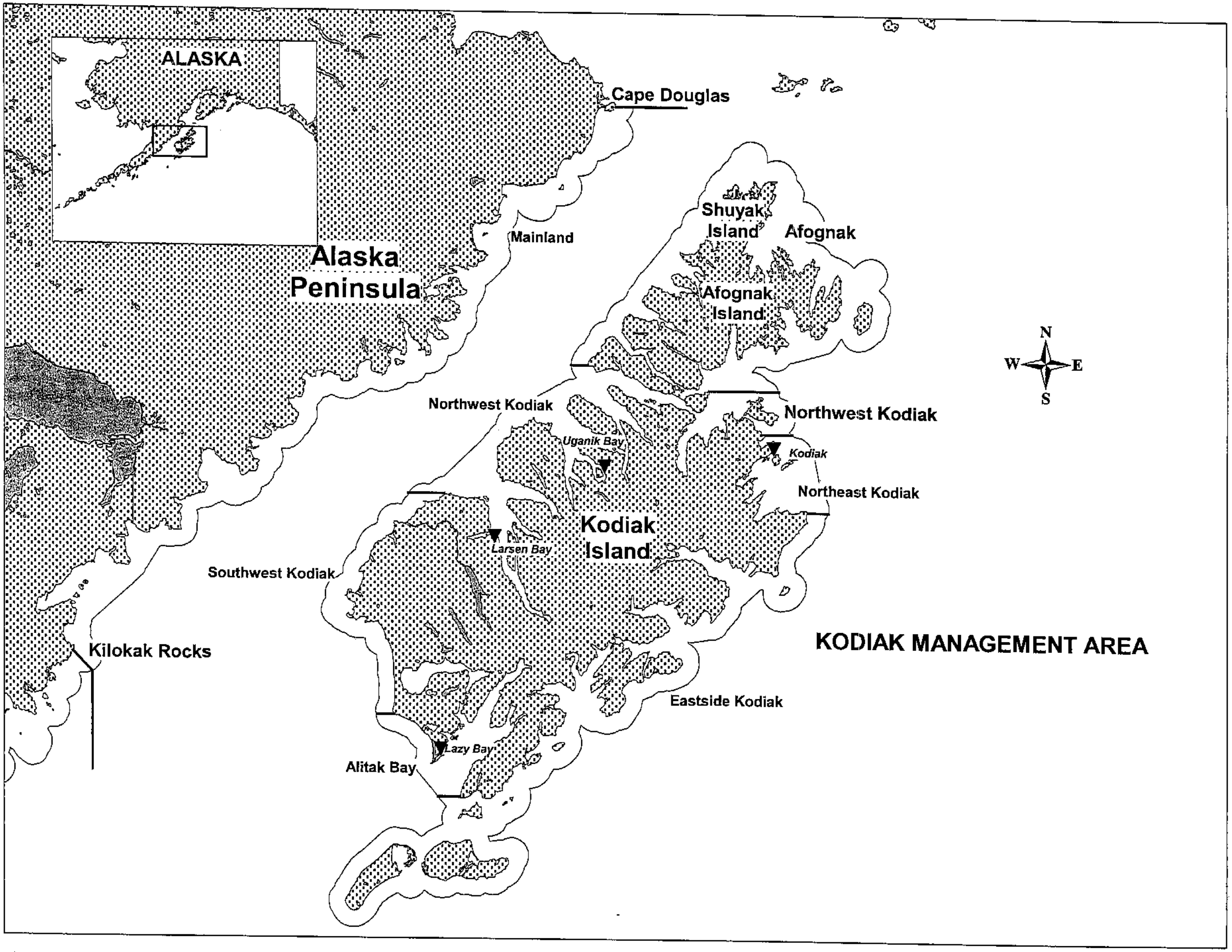


Figure 1. Map of the Kodiak Management Area identifying commercial salmon fishing districts and processing facility locations.

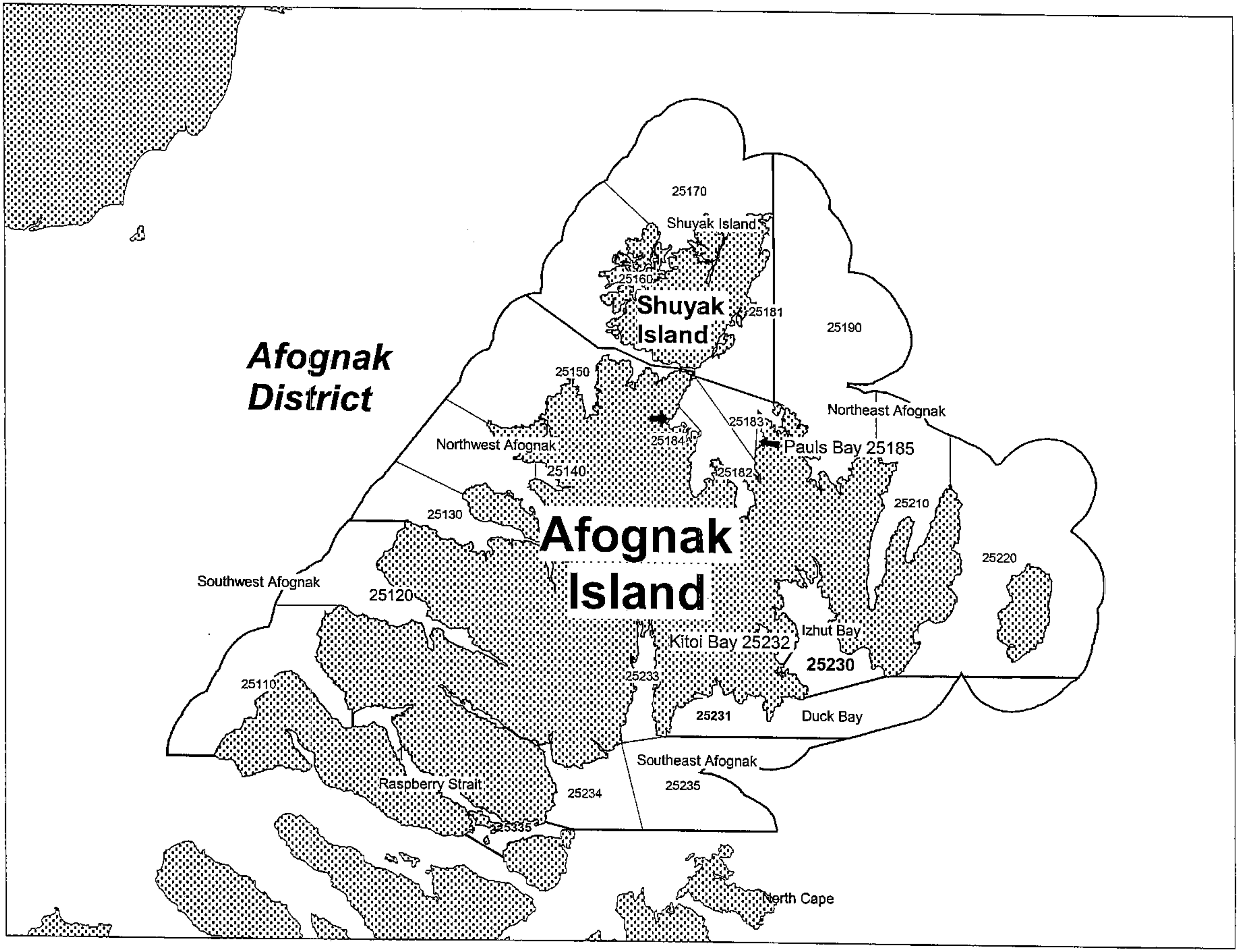


Figure 2. Map of the Afognak District identifying commercial salmon fishing sections and statistical areas.

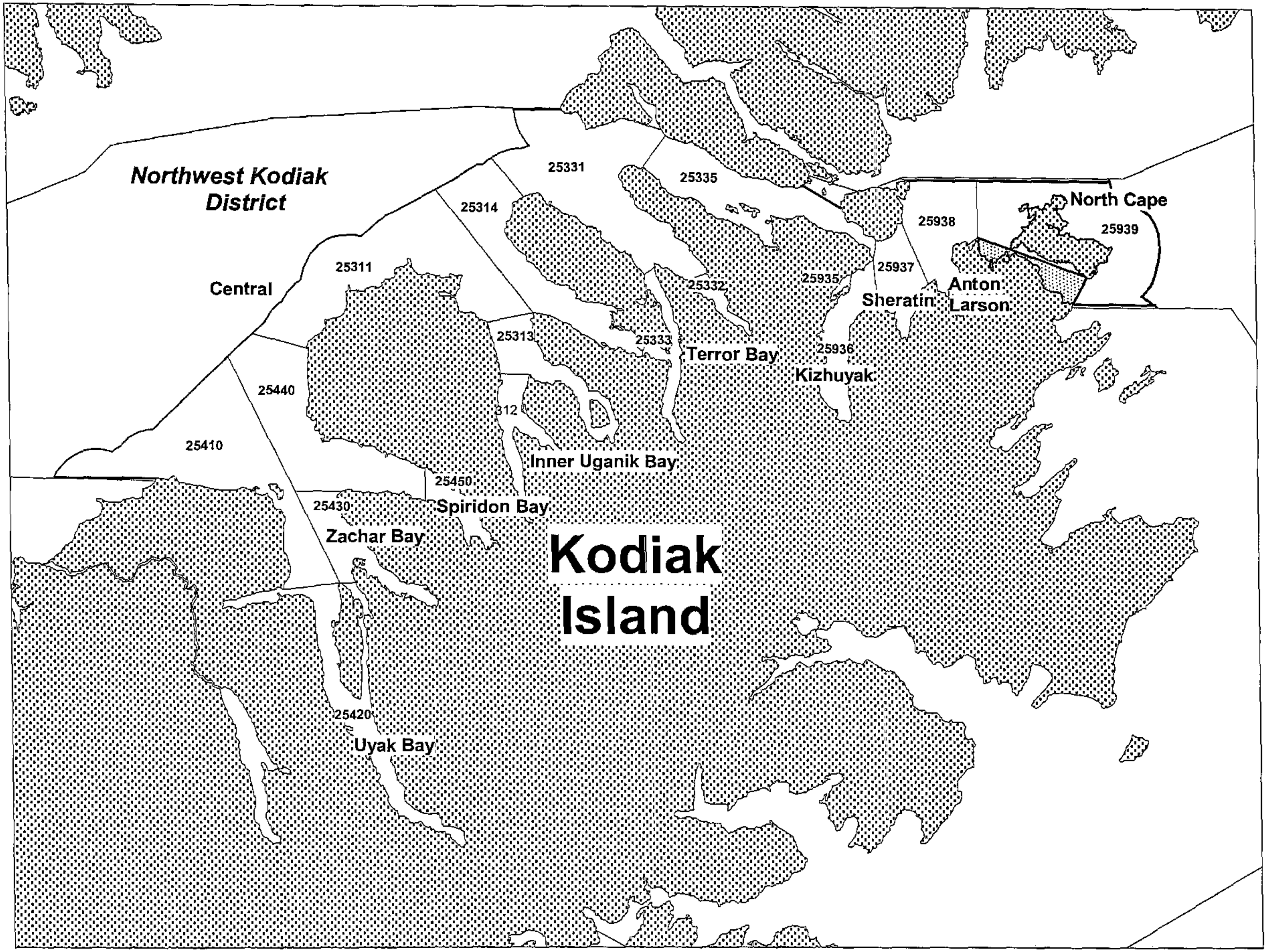


Figure 3. Map of the Northwest Kodiak District identifying commercial salmon fishing sections and statistical areas.

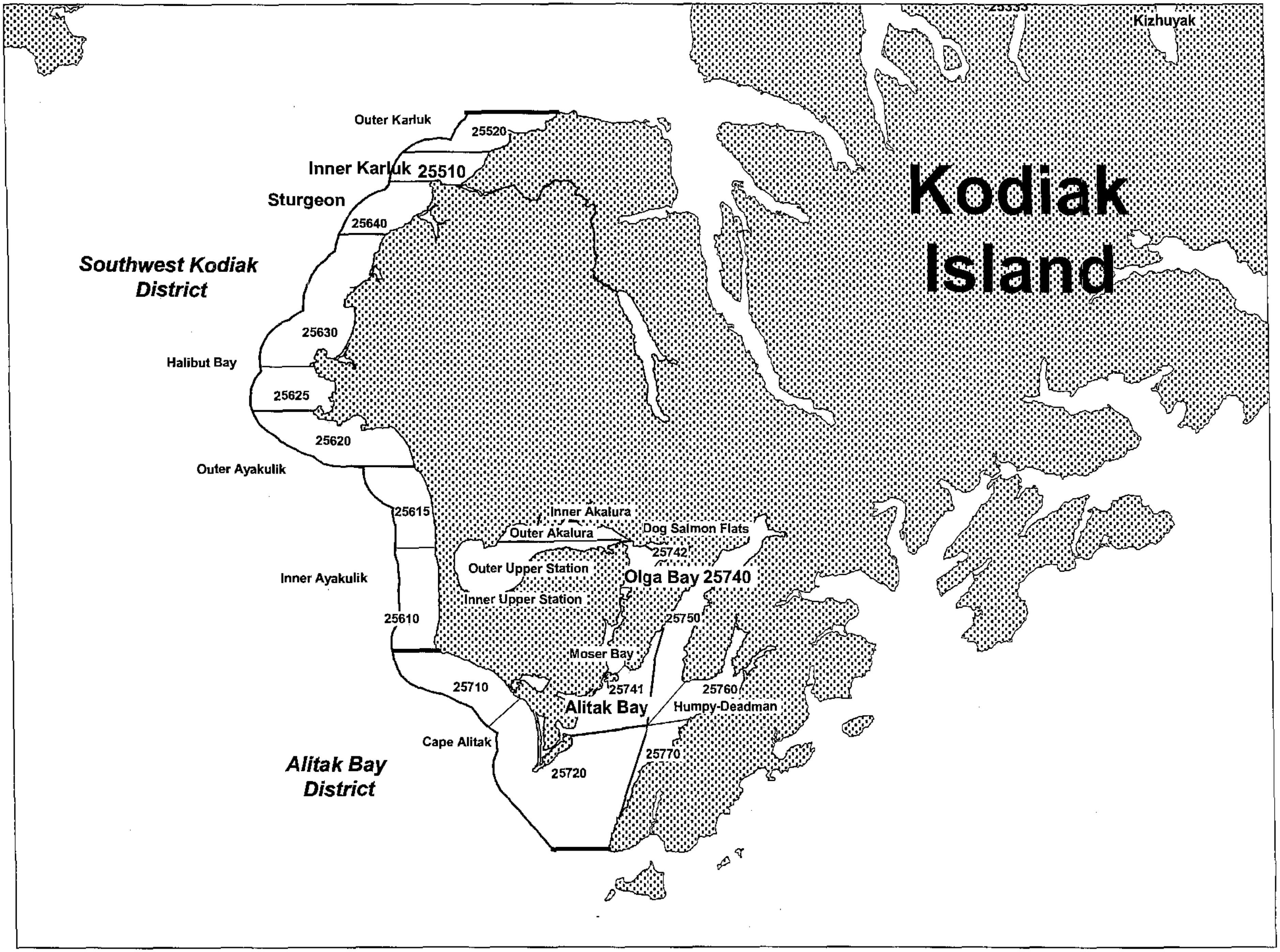


Figure 4. Map of the Southwest Kodiak and Alitak Bay Districts identifying salmon fishing sections and statistical areas.

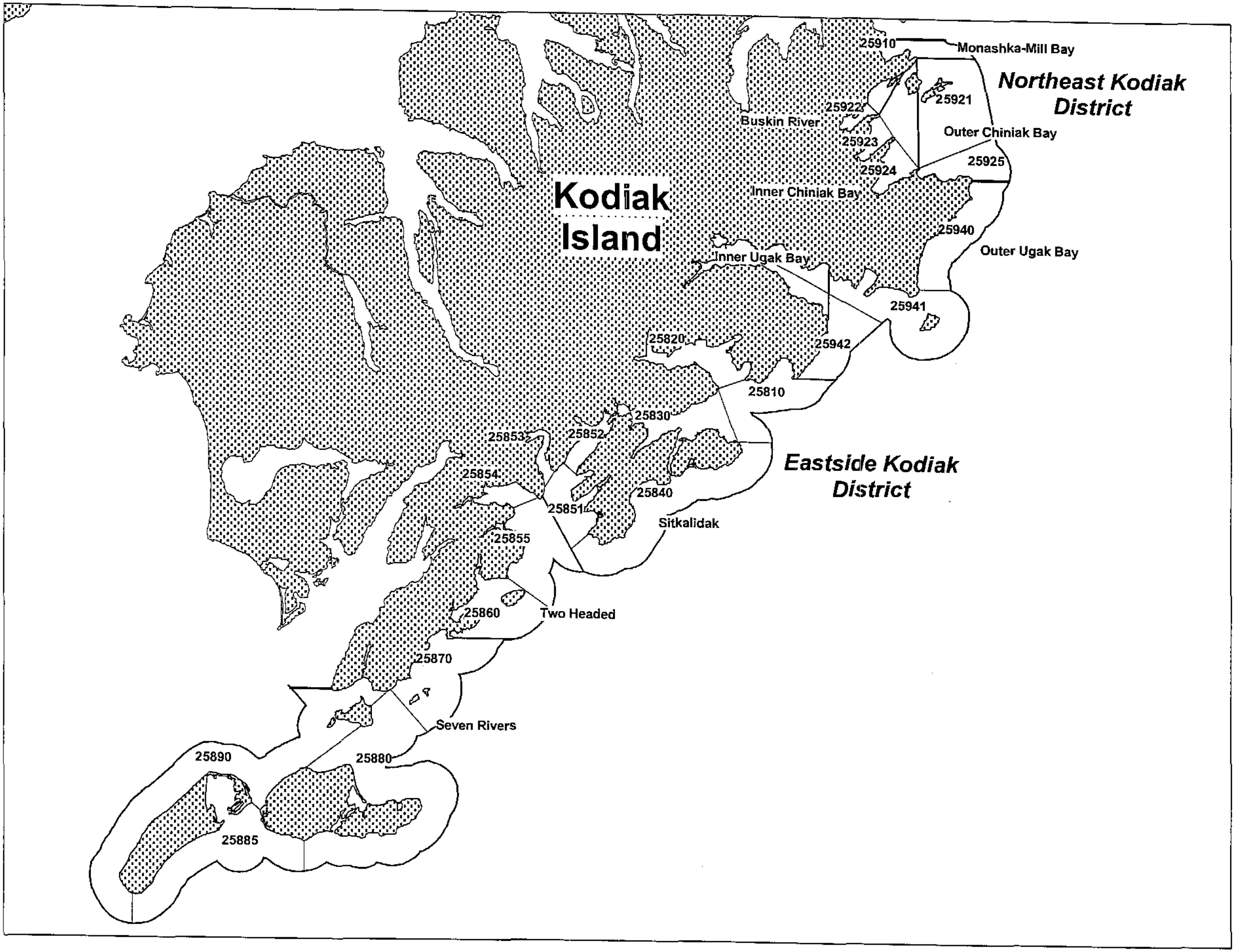


Figure 5. Map of the Northeast Kodiak and Eastside Kodiak districts identifying commercial salmon fishing sections and statistical areas.

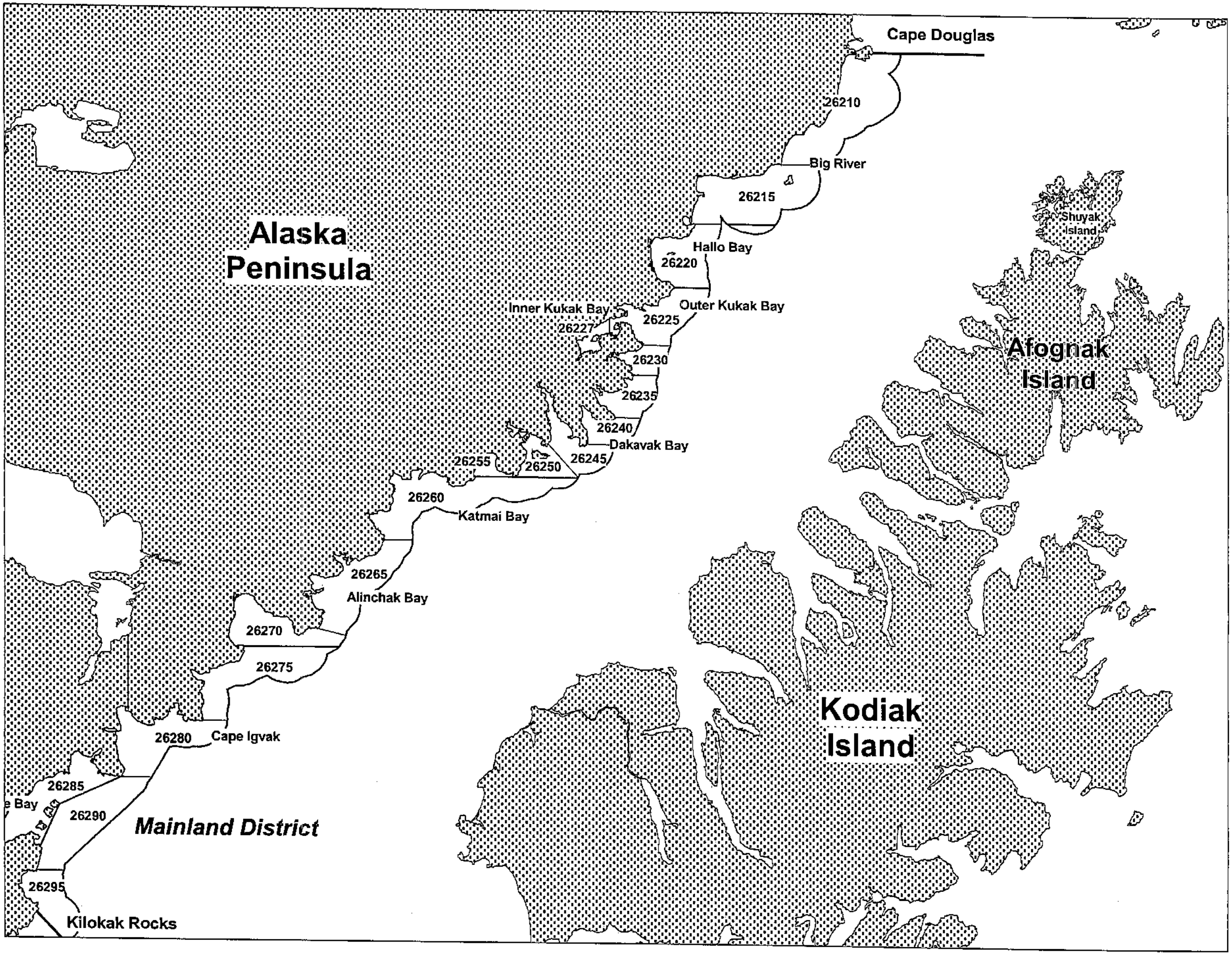


Figure 6. Map of the Mainland District identifying commercial salmon fishing sections and statistical areas.

APPENDIX

Appendix A.1. Sampling weeks and associated calendar dates, 2002.

Week	Calendar Dates	Week	Calendar Dates
1	01-Jan to 03-Jan	28	05-Jul to 11-Jul
2	04-Jan to 10-Jan	29	12-Jul to 18-Jul
3	11-Jan to 17-Jan	30	19-Jul to 25-Jul
4	18-Jan to 24-Jan	31	26-Jul to 01-Aug
5	25-Jan to 31-Jan	32	02-Aug to 08-Aug
6	01-Feb to 07-Feb	33	09-Aug to 15-Aug
7	08-Feb to 14-Feb	34	16-Aug to 22-Aug
8	15-Feb to 21-Feb	35	23-Aug to 29-Aug
9	22-Feb to 28-Feb	36	30-Aug to 05-Sep
10	01-Mar to 07-Mar	37	06-Sep to 12-Sep
11	08-Mar to 14-Mar	38	13-Sep to 19-Sep
12	15-Mar to 21-Mar	39	20-Sep to 26-Sep
13	22-Mar to 28-Mar	40	27-Sep to 03-Oct
14	29-Mar to 04-Apr	41	04-Oct to 10-Oct
15	05-Apr to 11-Apr	42	11-Oct to 17-Oct
16	12-Apr to 18-Apr	43	18-Oct to 24-Oct
17	19-Apr to 25-Apr	44	25-Oct to 31-Oct
18	26-Apr to 02-May	45	01-Nov to 07-Nov
19	03-May to 09-May	46	08-Nov to 14-Nov
20	10-May to 16-May	47	15-Nov to 21-Nov
21	17-May to 23-May	48	22-Nov to 28-Nov
22	24-May to 30-May	49	29-Nov to 05-Dec
23	31-May to 06-Jun	50	06-Dec to 12-Dec
24	07-Jun to 13-Jun	51	13-Dec to 19-Dec
25	14-Jun to 20-Jun	52	20-Dec to 26-Dec
26	21-Jun to 27-Jun	53	27-Dec to 31-Dec
27	28-Jun to 04-Jul		

Annually, salmon escapements and catches are sampled for age (scales), length, and sex by field crews throughout the state. This database is essential for sound management of the State's salmon resources.

To be useful, data must be recorded on the age, weight, length (AWL) opscan forms neatly and accurately. In addition, scale samples must be collected and mounted properly to ensure accurate age determination. The following procedures are to be strictly adhered to when sampling for age, length, and sex.

Procedures

COMPLETING THE OPSCAN (AWL) FORMS:

New **green** AWL forms have been developed which have Y2K date capabilities. Before transcribing any information, make sure the correct form is being used. The department no longer uses the outdated red or blue forms.

A completed AWL form and accompanying scale (gum) card for sampling sockeye salmon are shown in Appendix A.3. When collecting two scales per fish, as with coho salmon sampling, follow the procedure illustrated in Appendix A.4.

Complete each section on the left side of the AWL form using a No.2 pencil and darken the corresponding circles as shown in the figures. Make every effort to darken the entire circle as the optical scanner, which reads and records the data from the AWL forms, may not recognize partially filled circles. Label only one form at a time to avoid a "carbon paper effect" resulting in stray marks. Special care should be used to assure that stray marks do not occur on either side of the AWL form. Stray marks and scuffed AWL forms can severely hamper scanning.

Fill out each of the following:

Description
Record the following: species/area/catch or escapement/gear type (if applicable)/samplers.

Card
The AWL forms and corresponding (gum) card(s) are numbered sequentially by date throughout the season starting with 001. A separate numbering sequence will be used for each species, district, and geographic location. Consult your crew leader for the current card number. Sockeye salmon scale samples will have only one (gum) card per AWL form as shown in Appendix A.3.

-Continued-

Species

Refer to the reverse side of the AWL form for the correct one digit code.

Day, Month, Year

Escapement sampling: Use appropriate digits for the date the fish are sampled.
Catch sampling: Use the date the fish were caught. If this differs from the sample date, note the sample date in the top margin.

District

List all districts in which the fish were caught. Consult your area statistical map or project leader for the appropriate district. If more than one district is represented, darken the corresponding circles of the district representing most of the catch.

Subdistrict (Section)

List all subdistricts in which the fish were caught. If the catch represents more than one section, list each section but do not darken the corresponding circles. Leave blank if the section is unknown.

Stream

Leave blank for catch sampling;
Consult area statistical map for the appropriate stream number when collecting escapement samples.

Location

List the appropriate code associated with the area the fish were sampled as shown in Appendix A.5.

Period

Escapement sampling: List the sample week in which the fish were sampled (Appendix A.2.).
Catch sampling: List the sample week in which the fish were caught. If this differs from the week the fish were sampled, note this in the top margin.

Project and Gear

Refer to the reverse side of the AWL form for the correct code.

Mesh

Leave blank unless specifically instructed by supervisor to do otherwise.

Type of length measurement

Use (2) mid-eye to fork-of-tail. Refer to Appendix A.6.

-Continued-

# of cards
Mark 1 (each AWL form is individually numbered).

If possible, keep the AWL litho codes in numerical order throughout the season and keep all forms flat, dry, and clean. Fish gurry and water curling may cause data to be misinterpreted by the optical scanning machine. **It is the responsibility of the crew leader to make sure that all forms are carefully edited before returning them to their supervisor.**

SCALE (GUM) CARDS

A completed AWL form and accompanying (gum) card for sampling sockeye salmon are shown in Appendix A.3. When collecting two scales per fish, as with coho salmon sampling, follow the procedure illustrated in Appendix A.4. Be sure to fill out the (gum) cards (in pencil) as shown in Appendix A.3 and A.4.

Species
Write out completely (e.g. sockeye).

Locality
Escapement sampling: Include the weir site followed by "escapement" (e.g., Karluk River escapement).
Catch sampling: Include the area(s) where fish were caught followed by "catch" (e.g., Uganik Bay catch).

Statistical Area Code
Fill in the appropriate digits from the AWL form. If catch samples are from a variety of statistical areas be sure to list each statistical area and approximate percentage from each (if available).

Sampling date
Escapement sampling: Fill in the date the fish were sampled.
Catch sampling: Use the date the fish were caught. The sample date may be noted in "remarks".

Gear
Write out completely. If catch samples include multiple gear types be sure to list each gear and approximate percentage from each (if available).

Collector(s)
Record the last names of person(s) sampling.

-Continued-

Remarks

Record any pertinent information such as number of scales per fish sampled, processing facility where sampling took place, vessel/tender name, etc. Be sure to transfer this information to the top margin of the AWL.

SAMPLING PROCEDURE

1. Place the fish on its right side to sample the left side.

2. Determine the sex of the fish (escapement sampling only) and darken M or F in the sex columns. If any difficulty is encountered with this procedure, write "I had trouble sexing these fish" on the top margin of the AWL and ask your supervisor for help as soon as possible before sexing additional fish.

3. Measure fish length in millimeters from mid-eye to fork-of-tail (escapement sampling only; Appendix A.6). Record length by blackening the appropriate column circles on the AWL form. Column 3 on the AWL form is used for fish with a length greater than 999 millimeters (Chinook). Measure all species of salmon to the nearest mm. When collecting length data, take care to ensure that each length corresponds to the appropriate scale mounted on the (gum) card, as length-at-age is evaluated for each sample.

4. Remove the "preferred scale" from the fish by grasping its exposed posterior edge with forceps and pulling free (Appendix A.7). Remove all slime, grit, and skin from the scale (neoprene wristers work well for this). The preferred scale is located on the left side of the fish, two rows above the lateral line on the diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin. If the preferred scale is missing, select a scale within the preferred area on the other side of the fish. If no scales are present in the preferred area on either side of the fish, sample a scale as close to the preferred area as possible and darken the 8 under "age error code" on the AWL form. Do not select a scale located on the lateral line.

5. It is important to take care that scales adhere to the (gum)card, rough side up. Therefore, without turning the forceps over, clean, moisten, and mount the scale on the (gum) card with your thumb or forefinger. Exert just enough pressure to spread and smooth the scales directly over the number as shown in Appendix A.7. The ridges on the sculptured side can be felt with a fingernail or forceps. Mount scale with anterior end oriented toward top of (gum) card. All scales should be correctly oriented on the card in the same direction (Appendix A.8.).

6. Repeat steps 1 through 4 for up to 40 fish on each AWL form.

-Continued-

7. When sampling at weirs you may use "Rite in the Rain"® books to record the data. Keep the AWL forms in camp where they will be clean, dry, and flat. After sampling is done for the day, transfer the data to the AWL forms. **Each length, sex, and scale must correspond to a single fish! It is the responsibility of the crew leader to be sure the data has been transcribed correctly and the AWL forms filled out completely. Log books containing length and sex data should be returned to Matt Foster at the end of the season**. These are considered raw data and need to be archived. If you choose to record raw data on tape, these tapes must be returned to Matt Foster.

SAMPLING CHECKLIST

OPERATIONAL PLAN	PENCILS (NO. 2)
(gum) CARDS	FORCEPS
AWL FORMS **(GREEN)**	PLASTIC CARD HOLDERS
NEOPRENE WRISTERS	CLIPBOARD
MEASURING BOARD	LOG BOOK

SOME REMINDERS

1. For greater efficiency in scale reading, mount scales with anterior end toward top of (gum) card.

2. AWL forms should be carefully edited. Remember, use the new AWL forms (green) as the red and blue forms are outdated. Re-check header information on AWLs; make sure all available information is filled in. Take extra care to use the correct period code (sampling week) for the sampling or catch date. AWL numbers should not be repeated; a frequent error is to begin a week's sample with the last AWL number used the week before. This is particularly important if the data is regularly sent to town; it is easy to forget which AWL numbers were used. Crew leaders should take time to ensure that the circles are being blackened correctly. If the circles are sloppily marked, the optical scanner records the information incorrectly or misses it entirely.

-Continued-

3. Transfer important comments from the scale (gum) cards to the AWLs. After pressing scales, the cards are seldom referred to again, and important remarks can be lost. Write comments in the top right margin. If there is not room on the AWL to completely explain the remarks, use a separate piece of paper.

4. Never put data from different dates on one AWL or one (gum) card. Even if only one scale is collected that day, begin a new AWL and (gum) card the next day.

5. If weights are taken, they may be noted in the right margin of the AWL during sampling, but be sure to transfer the weights and litho code to the appropriate columns on the reverse of the AWL before submitting it to your supervisor.

6. Try to keep the litho codes (located in the left margin of the AWL) in numerical order. This should not be hard to do if they are arranged that way before page numbering. When sampling different areas throughout the season, arrange the litho codes in order before each sample is taken.

7. If AWLs get wrinkled or splotched they should be transcribed onto a new AWL prior to sending in. The optical scanning computer will misread or reject torn or wrinkled sheets. <u>Do not</u> use paperclips on AWL forms.

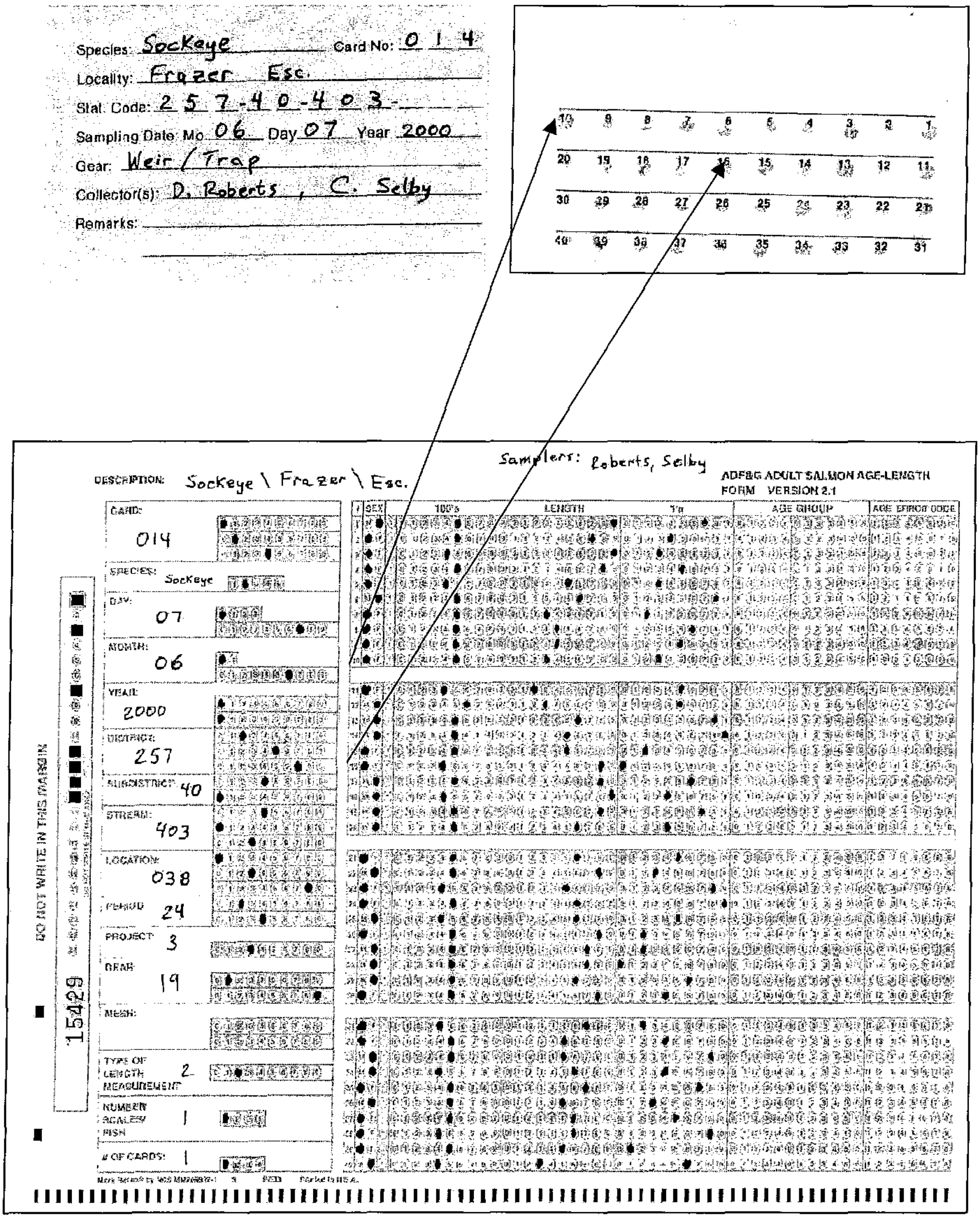
8. Be careful when collecting and mounting scales in wet conditions (rain, high humidity, etc.). If glue dries on top of the scale, it often obscures scale features, resulting in an unreadable scale. In addition, scales frequently adhere poorly to a wet (gum) card. Protect the cards and keep them dry to avoid having to remount the scales on a new card. If the cards get wet, try to dry them in a protected area or remount if necessary. <u>Remember, use a pencil when filling out (gum) cards, because ink will come off during pressing</u>.

9. Scan the AWL form for mistakes. A common error occurs, for instance, in placing both the 4 and 7 of a 475mm fish in the 100s column with nothing in the 10s column.

10. Avoid accumulation of incomplete AWL forms. In previous years, there have been cases where individuals have completed several samples before transcribing the information on the AWL forms. This may lead to an increase in errors. After a sample has been completed, try to get the AWL forms filled out as soon as possible. This will ensure more accurate information, as any problems or abnormalities concerning the sample (i.e., many jacks in sample, many fish lacking preferred scale, number of scales do not match number of lengths recorded, etc.) will be fresh in your mind.

11. Responsibility for accuracy lies first with the primary data collector(s) and finally with the crew leader. Sloppy or incomplete data forms or (gum) cards will be returned to individual collectors for correction.

Appendix A.3. Completed AWL (front side) and salmon scale (gum) card.

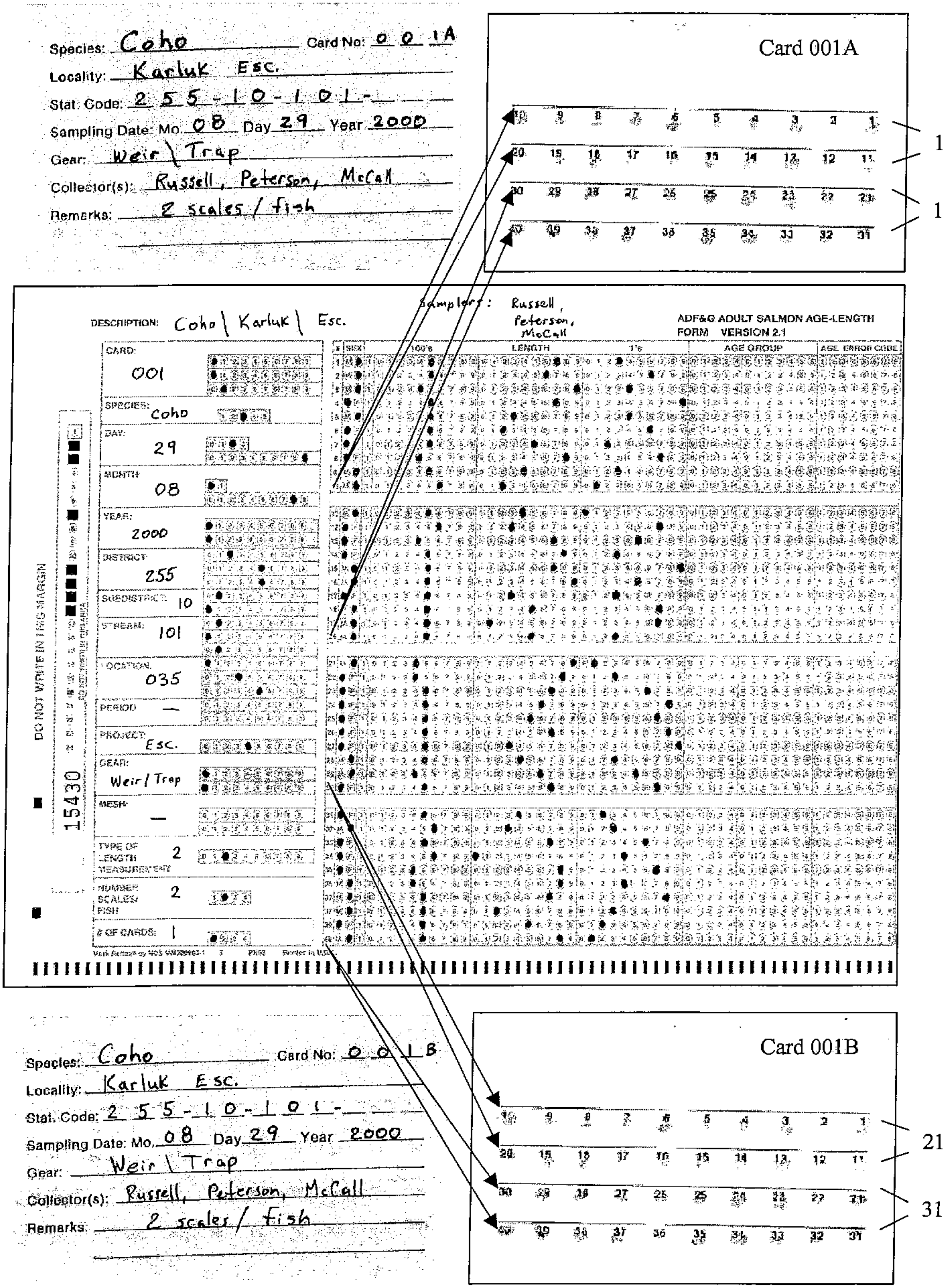


Species: Sockeye Card No: 0 1 4
Locality: Frazer Esc.
Stat. Code: 2 5 7 - 4 0 - 4 0 3 -
Sampling Date Mo 06 Day 07 Year 2000
Gear: Weir / Trap
Collector(s): D. Roberts , C. Selby
Remarks:

10 9 8 7 6 5 4 3 2 1
20 19 18 17 16 15 14 13 12 11
30 29 28 27 26 25 24 23 22 21
40 39 38 37 36 35 34 33 32 31

Samplers: Roberts, Selby
DESCRIPTION: Sockeye \ Frazer \ Esc.
ADF&G ADULT SALMON AGE-LENGTH FORM VERSION 2.1
CARD: 014
SPECIES: Sockeye
DAY: 07
MONTH: 06
YEAR: 2000
DISTRICT: 257
SUBDISTRICT: 40
STREAM: 403
LOCATION: 038
PERIOD: 24
PROJECT: 3
GEAR: 19
MESH:
TYPE OF LENGTH MEASUREMENT: 2
NUMBER SCALES/FISH: 1
OF CARDS: 1
SEX 100's LENGTH 1's AGE GROUP AGE ERROR CODE
DO NOT WRITE IN THIS MARGIN
15429

Appendix A.4. Completed AWL (front side) and salmon scale (gum) card when sampling 2 scales per fish.



Species: Coho Card No: 0 0 1A
Locality: Karluk Esc.
Stat. Code: 2 5 5 - 1 0 - 1 0 1 -
Sampling Date: Mo. 08 Day 29 Year 2000
Gear: Weir \ Trap
Collector(s): Russell, Peterson, McCall
Remarks: 2 scales / fish

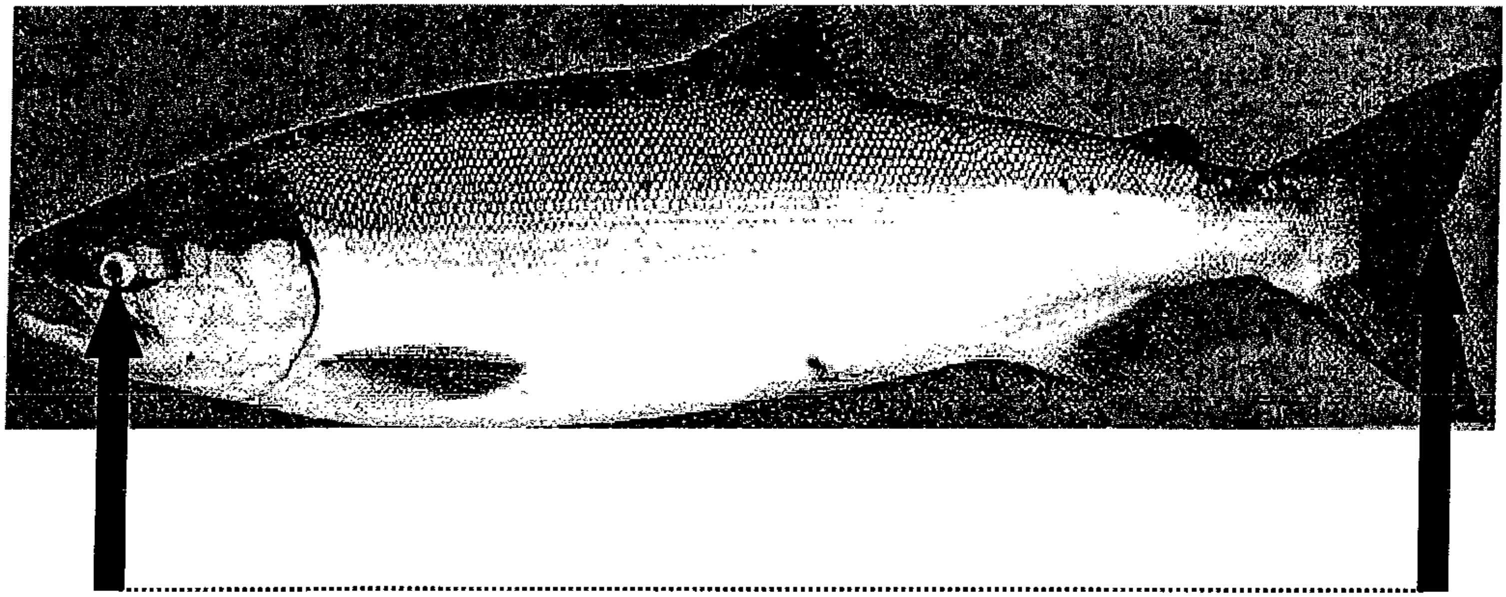
Species: Coho Card No: 0 0 1 B
Locality: Karluk Esc.
Stat. Code: 2 5 5 - 1 0 - 1 0 1 -
Sampling Date: Mo. 08 Day 29 Year 2000
Gear: Weir \ Trap
Collector(s): Russell, Peterson, McCall
Remarks: 2 scales / fish

Appendix A.5. Assigned port and weir location codes.

Port and Location Codes

029	Uganik
030	Lazy Bay
031	Port of Kodiak
032	Pauls Lake
033	Thorsheim
034	Afognak River
035	Karluk River
036	Ayakulik (Red River)
037	Upper Station
038	Frazer Lake
039	Dog Salmon
040	Akalura River
041	Uganik River
042	Malina Creek
043	Portage Lake
044	Foul Bay (FBTHA)
045	Larsen Bay
046	Spiridon (SLTHA)
047	Little Kitoi
048	Waterfall Bay (WBTHA)
049	Little River
050	King Cove
051	Port Moller
052	Dutch Harbor
053	Akutan
054	Sand Point
055	Bear River
056	Nelson River
057	Canoe Bay
058	Ilnik Lagoon
059	Orzinski River
060	Sandy River
061	Thin Point Lagoon
062	Middle Lagoon
070	Black Lake
071	Chignik Weir
072	Chignik (Processing facilities)

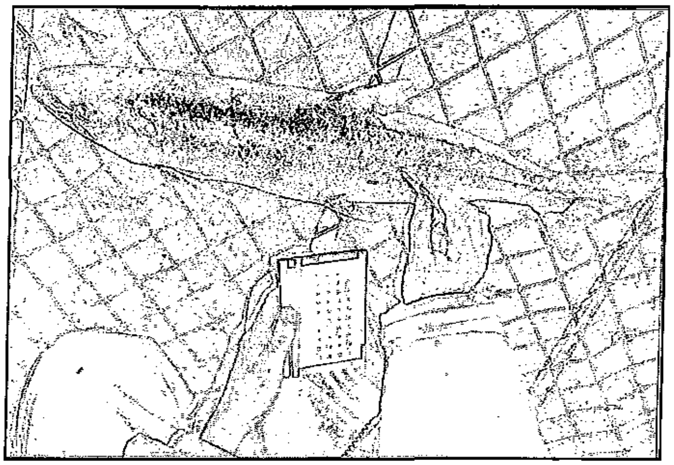
Appendix A.6. Measuring fish length from mid eye to tail fork.

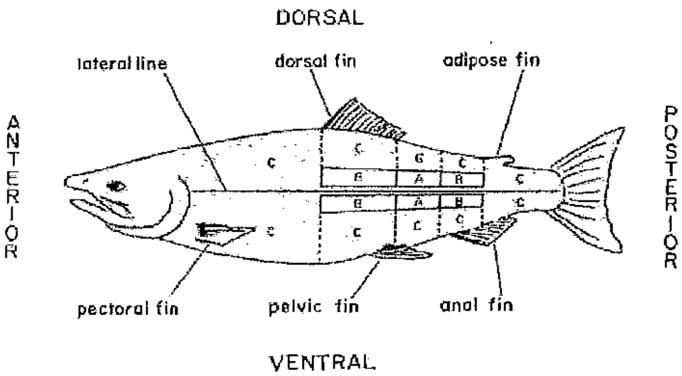


Mid eye to tail fork lengths are taken because the shape of the salmon's snout changes as it approaches sexual maturity. The procedure for measuring by this method is as follows.

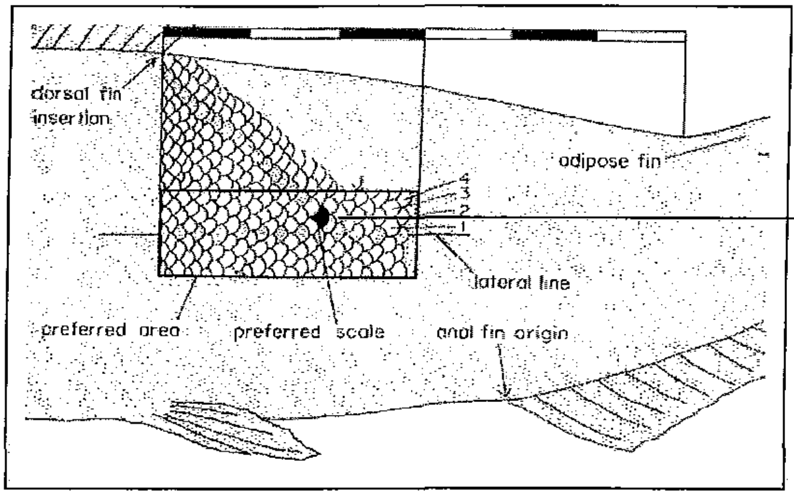
1) Place the salmon flat on its right side (on the measuring board) with its head to your left and the dorsal fin away from you.
2) Slide the fish in place so that the middle of the eye is in line with the edge of the meter stick and hold the head in place with your left hand.
3) Flatten and spread the tail against the board with your right hand.
4) Read and record the mid eye tail fork length to the nearest millimeter.

Appendix A.7. Removal and mounting of the preferred salmon scale.

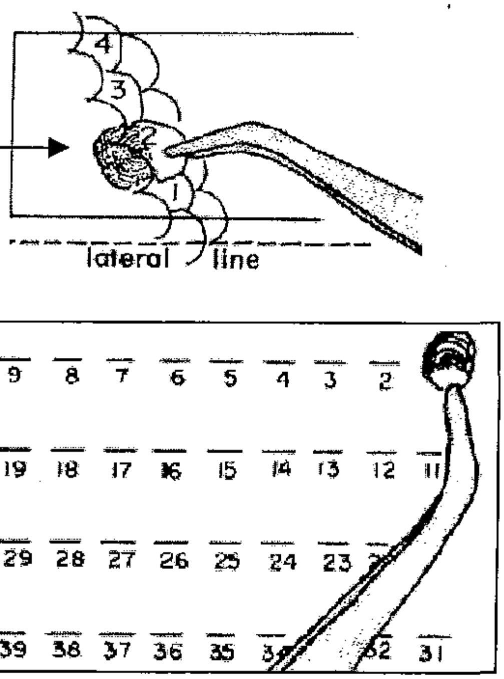




<u>INPFC rated areas for scale removal</u>. Area A is the preferred area. Area B is the second choice if there are no scales in area A. Area C designates non preferred areas. If scales on the left side are missing, try the right side.

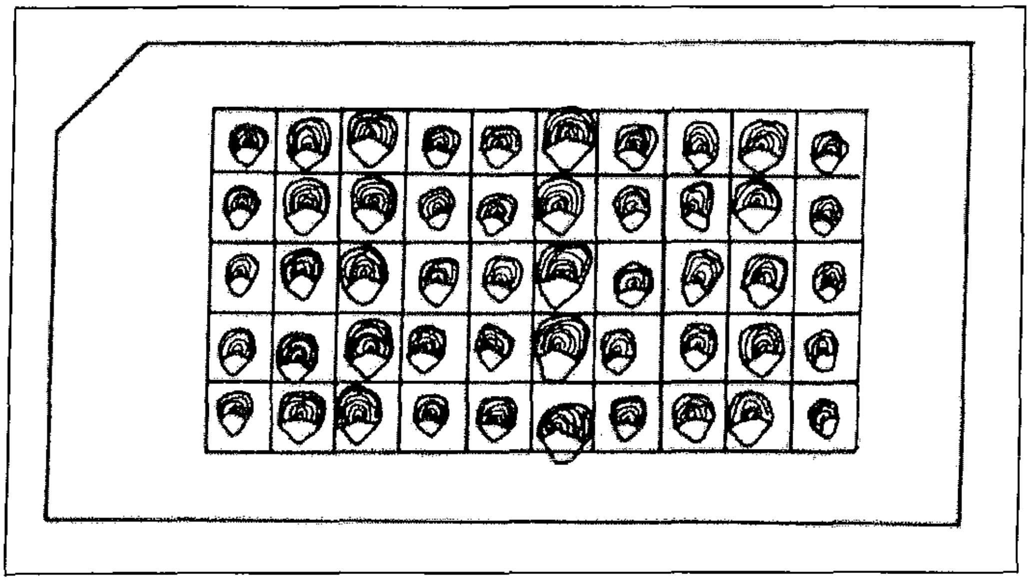


Do not turn scale over.

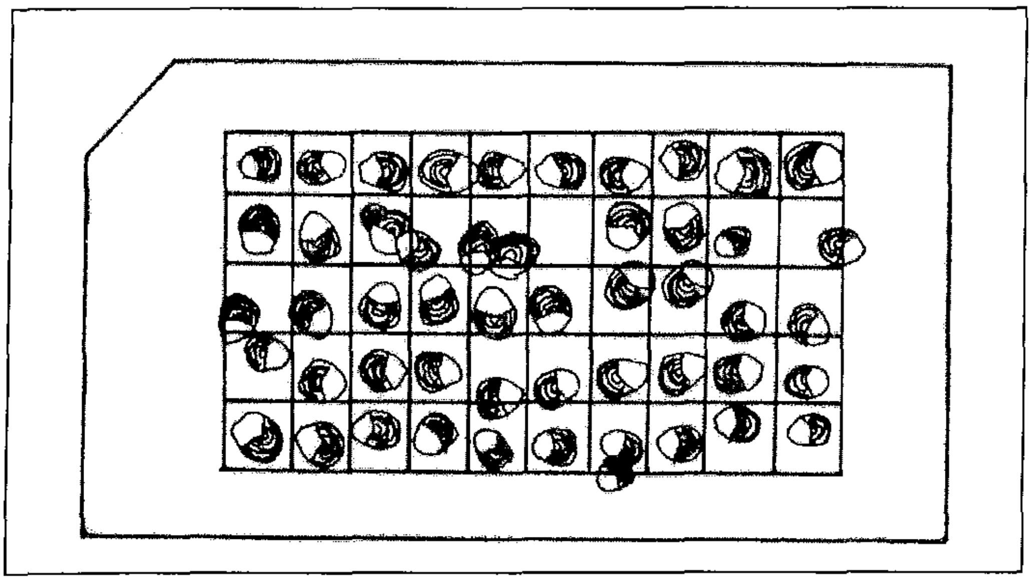


The preferred scale in this diagram is solid black. It is located 2 rows up from the lateral line, on a diagonal from the insertion (posterior) of the dorsal fin "back" toward the origin of the anal fin.

Appendix A.8. Scale orientation on the salmon scale (gum) card.



The scales are all correctly oriented on the card in the same direction, with the anterior portion of the scale pointed toward the top of the card.



The scales are incorrectly oriented in different directions. This increases the time spent to age samples.

KODIAK MANAGEMENT AREA SALMON ESCAPEMENT SAMPLING OPERATIONAL PLAN, 2002

by
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April 2002

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INTRODUCTION

The Kodiak Management Area (KMA) encompasses the entire Kodiak Archipelago and that portion of the Alaska Peninsula draining into Shelikof Strait from Cape Douglas to Kilokak Rocks (Figure 1). The archipelago and Alaska Peninsula portions of the management area are each about 241 km in length and Shelikof Strait, separating the two, averages 48 km in width.

The KMA is composed of seven commercial salmon fishing districts and 52 sections, which include 440 streams supporting salmon spawning populations. Emphasis of the management program is to achieve biological escapement goals while ensuring local stock surplus production is harvested in an orderly fashion (Prokopowich 1999). Five species of salmon are harvested within the KMA, all of which have established biological escapement goal ranges. The "targeted" escapement goals for KMA salmon are: 11 to 18 thousand chinook *Oncorhynchus tshawytscha,* 1.3 to 1.8 million sockeye *O. nerka*, 1.0 to 3.0 million pink *O. gorbuscha* (even year), 55 to 94 thousand coho *O. kisutch*, and 273 to 819 thousand chum salmon *O. keta* (Nelson and Lloyd 2001). Directed commercial fisheries occur on sockeye, pink, chum, and coho salmon; chinook salmon are not targeted. To open and close the fishery inseason, managers employ qualitative analysis of run timing, catch per unit effort (CPUE), species composition of catch, regulatory management plans, aerial surveys, and estimates of salmon build-up and escapement (daily weir counts).

Weirs provide the primary mode of enumeration for virtually all chinook salmon and a majority of the sockeye salmon escapements into area streams. Aerial and foot surveys are conducted on area streams for indexing pink, chum, and coho salmon escapements (Prokopowich 1998). Annually, the Alaska Department of Fish and Game (ADF&G), Division of Commercial Fisheries, samples sockeye salmon escapements from major and minor systems (Figure 1) for biological characteristics (age, length, and sex). These samples provide the foundation for preseason run forecasts, escapement goal evaluation, and accurate assignment of the run to stock of origin (run reconstruction). As the demand on KMA salmon resource increases, so does the intrinsic value of these data. Therefore, it is imperative that all data collected be of the highest quality possible.

GOAL

Provide age, length, and sex composition data from the KMA sockeye salmon escapements to assist with the long term management of the KMA sockeye salmon runs.

OBJECTIVES

Provide specific data, derived from sampling of the KMA salmon escapement, that will facilitate:

1. Estimation of the age (scales), length, and sex composition of sockeye salmon escapements into four major and 11 minor systems in the KMA.
2. Construction of accurate brood tables.
3. Development of accurate run forecasts.
4. Evaluation of escapement goals and run timing.
5. Addressing mixed stock fishery issues and annual run reconstruction projects through scale pattern analysis (SPA).

TASK

Collect representative samples of scales (for age determination and SPA), length, and sex from escapement into four major and 11 minor sockeye salmon systems within the KMA.

SUPERVISION

Westward Region finfish research biologist Mark Witteveen will act as overall project leader and supervise inseason progress. Westward Region finfish research biologists Nick Sagalkin will supervise escapement sampling at Frazer Lake fishpass, Steve Schrof will supervise escapement sampling at Malina Lake and Little Kitoi fishpass, Rob Baer will supervise escapement sampling at Pauls Lake and terminal catch sampling at Foul Bay Terminal Harvest Area (FBTHA) and Waterfall Bay Terminal Harvest Area (WBTHA), and Steve Honnold will supervise terminal catch sampling at Spiridon Lake Terminal Harvest Area (SLTHA). Kodiak area management biologists Jeff Wadle and Dennis Gretsch will supervise escapement sampling at Akalura River, Ayakulik River, Bear Creek, Big Creek, Litnik River, Karluk River, Upper Station River, and Saltery River weir camps. In addition, the Kodiak National Wildlife Refuge will be operating a weir at Little River and conducting ALS sampling. Kodiak salmon catch sampling supervisor Matt Foster will monitor weekly escapement sampling and review incoming data for quality, quantity, and timeliness. A log book will be maintained tracking weekly samples, and weir crew leaders will be given feedback periodically regarding data quality.

PROCEDURES

Weekly sockeye salmon escapement sampling for age, length, and sex (ALS) will be conducted at Karluk River, Upper Station, and Ayakulik River weirs, and at Frazer Lake fishpass (Figure 1). Samples will be collected using a live box trap (Figure 2) according to the schedule in Table 1. In an attempt to collect a better representation of weekly escapements, three 80 fish samples will be collected weekly (sample week) on alternating days (Saturday, Tuesday, and Thursday). This will provide for a minimum weekly sample size of 240 fish (Thompson 1987). However, if escapements begin to drop off and there is concern that the minimum sample size will not be achieved, adjustments in sampling efforts should be implemented so that the weekly goal of 240 is not compromised. During 2002, the sampling week starts on Friday and ends on Thursday. Sampling weeks and corresponding calendar dates are listed in Appendix A.1.

Minor systems will be sampled with reduced frequency following the sampling schedule in Table 1. At Saltery River, 240 fish will be sampled on a biweekly basis. Age, length, and sex data will be collected intermittently, spread throughout the season, from Akalura Lake, Malina Lake, Little Kitoi fishpass, Pauls Lake, Little River, FBTHA, and WBTHA following the sampling schedule presented in Table 1. Additionally, age, length, and sex samples will be collected from SLTHA and Litnik with a targeted sample size of 240 per week.

The standard procedures for collecting and recording salmon age, length, and sex data are defined in Appendix A.2-8. The accuracy of the data and scale sample quality will be the responsibility of the field camp crew leader. It is essential that all samples be representative of the true escapement, therefore, bias will be avoided by NOT pre-selecting fish based upon size, sex, condition or any other factor. If questions or problems arise, crew supervisors should be contacted for clarification or assistance.

DATA REPORTING

KMA weir crew leaders will notify Kevin Brennan, Dennis Gretsch, Jeff Wadle, Steve Honnold, Steve Schrof, Nick Sagalkin, or Rob Baer via Single Side Band radio upon completion of weekly sampling. Field camp personnel will send completed samples back to Kodiak on return grocery or mail flights. Packages should be clearly labeled to include: system, sample dates, and Attn: Matt Foster. The pilot should be instructed to call Fish and Game at 486-1857 for package pick-up.

LITERATURE CITED

Nelson, P.A. and D.S. Lloyd. 2001. Escapement goals for pacific salmon in the Kodiak, Chignik, and Alaska Peninsula/Aleutian Islands areas of Alaska. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K01-66, Kodiak.

Prokopowich, D. 1999. Kodiak Area Commercial Salmon Fishery Harvest Strategy, 1999. Alaska Department of Fish and Game, Commercial Fisheries Division, Regional Information Report No. 4K99-38, Kodiak.

Prokopowich, D. 1998. An overview of the Kodiak Management Area commercial salmon fisheries with emphasis on management activities, harvest strategies, and stock status, 1998. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 4K98-53, Kodiak.

Thompson, S.K. 1987. Sample size for estimating multinomial proportions. The American Statistician 41 (1):42-46.

Table 1. Kodiak Management Area sockeye salmon escapement sampling schedule, 2002.

Sample Location	*Statistical Area*	*Sampling Frequency*	*Date Starting*	*Ending*	*Sample Size*
Akalura weir	257-31-302	intermittently	1-Jun	15-Jul	480
			1-Aug	15-Sep	480
Ayakulik weir	256-15-201	3 times per week	1-Jun	1-Aug	240 (total per week)[c]
Frazer Fishpass	257-40-403	3 times per week	15-Jun	30-Aug	240 (total per week)[c]
Foul Bay (FBTHA)[a]	251-41	intermittently	9-Jun	1-Jul	600
Karluk weir	255-10-101	3 times per week	1-Jun	30-Sep	240 (total per week)[c]
Litnik (Afognak) weir	252-34-342	weekly	1-Jun	20-Jul	240
Malina Lake weir	251-10-105	intermittently	1-Jun	15-Aug	600
Little Kitoi fishpass	252-32-323	intermittently	1-Jun	15-Aug	600
Little River weir[b]	253-11-115	intermittently	1-Jun	31-Jul	240
Pauls Lake	251-83-831	intermittently	6-Jun	3-Jul	200
Saltery River weir	259-41-415	biweekly	7-Jul	20-Jul	240
Upper Station weir	257-30-304	3 times per week	1-Jun	30-Sep	240 (total per week)[c]
Spiridon Lake (SLTHA)[a]	254-50-403	weekly	5-Jul	15-Sep	240
Waterfall Bay (WBTHA)[a]	251-84	intermittently	9-Jun	1-Jul	600

[a] Termiual catch sampling will be done to represent run.

[b] Little River Weir will be operated by the Kodiak National Wildlife Refuge.

[c] Sampling will take place 3 times per sampling week on alternating days (e.g. Saturday, Tuesday, and Thursday.)

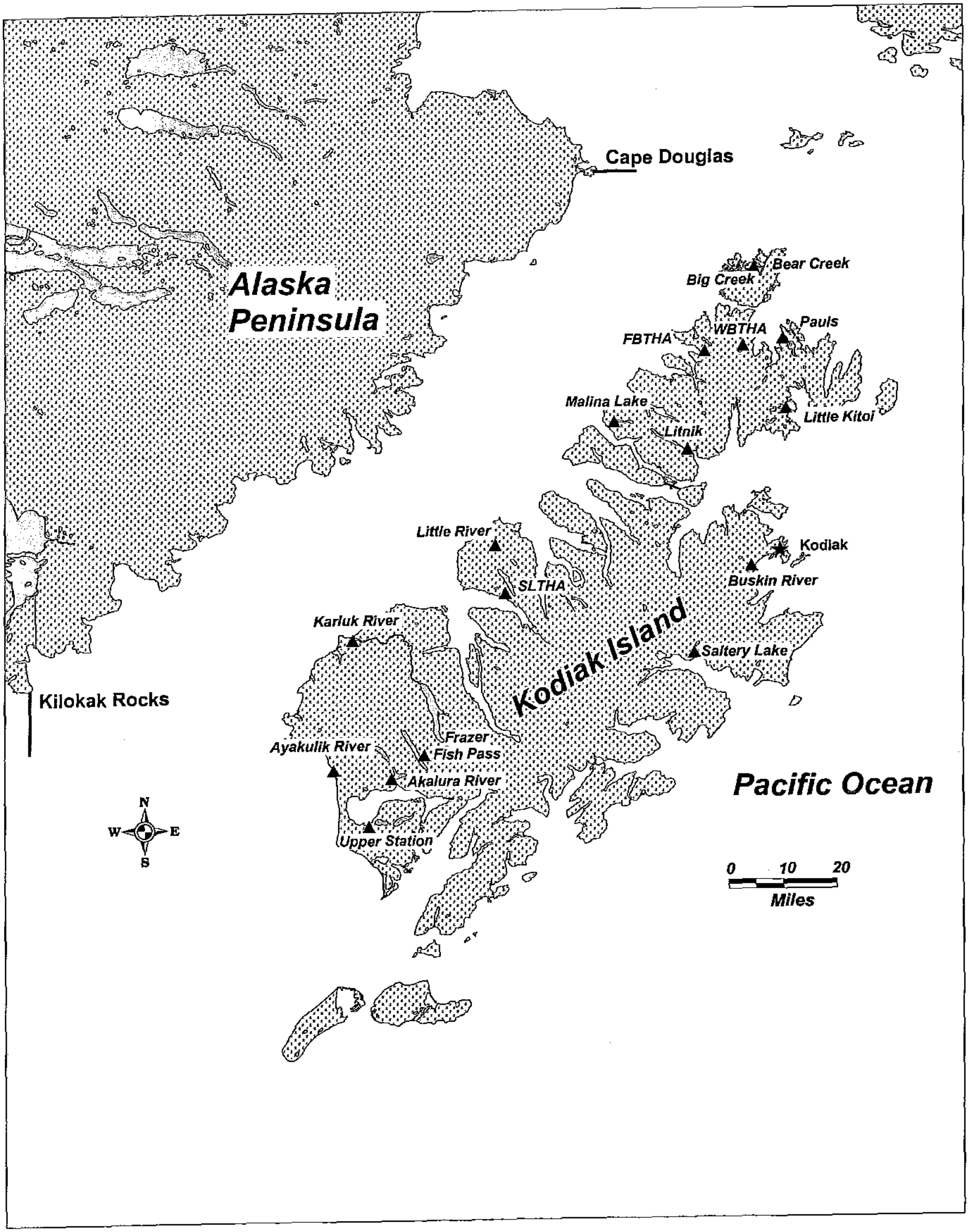


Figure 1. Salmon escapement sampling locations in the Kodiak Management Area, 2002.

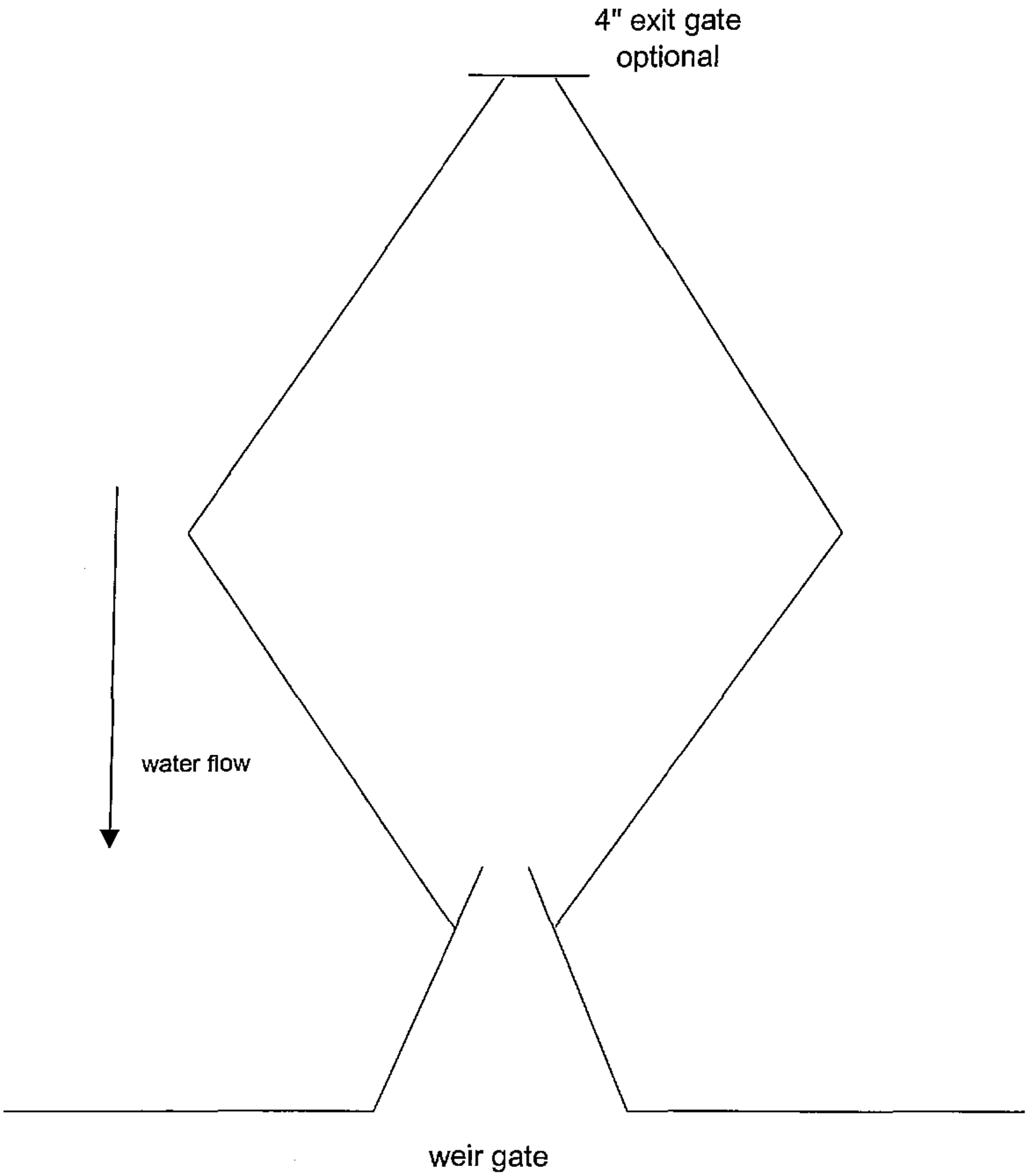


Figure 2. The Scott six panel adult salmon trap.

APPENDIX

Appendix A.1. Sampling weeks and associated calendar dates, 2002.

Week	Calendar Dates	Week	Calendar Dates
1	01-Jan to 03-Jan	28	05-Jul to 11-Jul
2	04-Jan to 10-Jan	29	12-Jul to 18-Jul
3	11-Jan to 17-Jan	30	19-Jul to 25-Jul
4	18-Jan to 24-Jan	31	26-Jul to 01-Aug
5	25-Jan to 31-Jan	32	02-Aug to 08-Aug
6	01-Feb to 07-Feb	33	09-Aug to 15-Aug
7	08-Feb to 14-Feb	34	16-Aug to 22-Aug
8	15-Feb to 21-Feb	35	23-Aug to 29-Aug
9	22-Feb to 28-Feb	36	30-Aug to 05-Sep
10	01-Mar to 07-Mar	37	06-Sep to 12-Sep
11	08-Mar to 14-Mar	38	13-Sep to 19-Sep
12	15-Mar to 21-Mar	39	20-Sep to 26-Sep
13	22-Mar to 28-Mar	40	27-Sep to 03-Oct
14	29-Mar to 04-Apr	41	04-Oct to 10-Oct
15	05-Apr to 11-Apr	42	11-Oct to 17-Oct
16	12-Apr to 18-Apr	43	18-Oct to 24-Oct
17	19-Apr to 25-Apr	44	25-Oct to 31-Oct
18	26-Apr to 02-May	45	01-Nov to 07-Nov
19	03-May to 09-May	46	08-Nov to 14-Nov
20	10-May to 16-May	47	15-Nov to 21-Nov
21	17-May to 23-May	48	22-Nov to 28-Nov
22	24-May to 30-May	49	29-Nov to 05-Dec
23	31-May to 06-Jun	50	06-Dec to 12-Dec
24	07-Jun to 13-Jun	51	13-Dec to 19-Dec
25	14-Jun to 20-Jun	52	20-Dec to 26-Dec
26	21-Jun to 27-Jun	53	27-Dec to 31-Dec
27	28-Jun to 04-Jul		

Appendix A.2. Procedure for sampling adult salmon for age, length, and sex.

Annually, salmon escapements and catches are sampled for age (scales), length, and sex by field crews throughout the state. This database is essential for sound management of the State's salmon resources.

To be useful, data must be recorded on the age, weight, length (AWL) opscan forms neatly and accurately. In addition, scale samples must be collected and mounted properly to ensure accurate age determination. The following procedures are to be strictly adhered to when sampling for age, length, and sex.

Procedures

COMPLETING THE OPSCAN (AWL) FORMS:

New **green** AWL forms have been developed which have Y2K date capabilities. Before transcribing any information, make sure the correct form is being used. The department no longer uses the outdated red or blue forms.

A completed AWL form and accompanying scale (gum) card for sampling sockeye salmon are shown in Appendix A.3. When collecting two scales per fish, as with coho salmon sampling, follow the procedure illustrated in Appendix A.4.

Complete each section on the left side of the AWL form using a No.2 pencil and darken the corresponding circles as shown in the figures. Make every effort to darken the entire circle as the optical scanner, which reads and records the data from the AWL forms, may not recognize partially filled circles. Label only one form at a time to avoid a "carbon paper effect" resulting in stray marks. Special care should be used to assure that stray marks do not occur on either side of the AWL form. Stray marks and scuffed AWL forms can severely hamper scanning.

Fill out each of the following:

Description

Record the following: species/area/catch or escapement/gear type (if applicable)/samplers.

Card

The AWL forms and corresponding (gum) card(s) are numbered sequentially by date throughout the season starting with 001. A separate numbering sequence will be used for each species, district, and geographic location. Consult your crew leader for the current card number. Sockeye salmon scale samples will have only one (gum) card per AWL form as shown in Appendix A.3.

-Continued-

Species
Refer to the reverse side of the AWL form for the correct one digit code.

Day, Month, Year
Escapement sampling: Use appropriate digits for the date the fish are sampled.
Catch sampling: Use the date the fish were caught. If this differs from the sample date, note the sample date in the top margin.

District
List all districts in which the fish were caught. Consult your area statistical map or project leader for the appropriate district. If more than one district is represented, darken the corresponding circles of the district representing most of the catch.

Subdistrict (Section)
List all subdistricts in which the fish were caught. If the catch represents more than one section, list each section but do not darken the corresponding circles. Leave blank if the section is unknown.

Stream
Leave blank for catch sampling;
Consult area statistical map for the appropriate stream number when collecting escapement samples.

Location
List the appropriate code associated with the area the fish were sampled as shown in Appendix A.5.

Period
Escapement sampling: List the sample week in which the fish were sampled (Appendix A.2.).
Catch sampling: List the sample week in which the fish were caught. If this differs from the week the fish were sampled, note this in the top margin.

Project and Gear
Refer to the reverse side of the AWL form for the correct code.

Mesh
Leave blank unless specifically instructed by supervisor to do otherwise.

Type of length measurement
Use (2) mid eye to tail fork. Refer to Appendix A.6.

-Continued-

# of cards
Mark 1 (each AWL form is individually numbered).

If possible, keep the AWL litho codes in numerical order throughout the season and keep all forms flat, dry, and clean. Fish gurry and water curling may cause data to be misinterpreted by the optical scanning machine. **It is the responsibility of the crew leader to make sure that all forms are carefully edited before returning them to their supervisor.**

SCALE (GUM) CARDS

A completed AWL form and accompanying (gum) card for sampling sockeye salmon are shown in Appendix A.3. When collecting two scales per fish, as with coho salmon sampling, follow the procedure illustrated in Appendix A.4. Be sure to fill out the (gum) cards (in pencil) as shown in Appendix A.3 and A.4.

Species
Write out completely (e.g. sockeye).

Locality
Escapement sampling: Include the weir site followed by "escapement" (e.g., Karluk River escapement).
Catch sampling: Include the area(s) where fish were caught followed by "catch" (e.g., Uganik Bay catch).

Statistical Area Code
Fill in the appropriate digits from the AWL form. If catch samples are from a variety of statistical areas be sure to list each statistical area and approximate percentage from each (if available).

Sampling date
Escapement sampling: Fill in the date the fish were sampled.
Catch sampling: Use the date the fish were caught. The sample date may be noted in "remarks".

Gear
Write out completely. If catch samples include multiple gear types be sure to list each gear and approximate percentage from each (if available).

Collector(s)
Record the last names of person(s) sampling.

-Continued-

Remarks

Record any pertinent information such as number of scales per fish sampled, processing facility where sampling took place, vessel/tender name, etc. Be sure to transfer this information to the top margin of the AWL.

SAMPLING PROCEDURE

1. Place the fish on its right side to sample the left side.

2. Determine the sex of the fish (escapement sampling only) and darken M or F in the sex columns. If any difficulty is encountered with this procedure, write "I had trouble sexing these fish" on the top margin of the AWL and ask your supervisor for help as soon as possible before sexing additional fish.

3. Measure fish length in millimeters from mid eye to tail fork (escapement sampling only; Appendix A.6). Record length by blackening the appropriate column circles on the AWL form. Column 3 on the AWL form is used for fish with a length greater than 999 millimeters (Chinook). Measure all species of salmon to the nearest mm. When collecting length data, take care to ensure that each length corresponds to the appropriate scale mounted on the (gum) card, as length-at-age is evaluated for each sample.

4. Remove the "preferred scale" from the fish by grasping its exposed posterior edge with forceps and pulling free (Appendix A.7). Remove all slime, grit, and skin from the scale (neoprene wristers work well for this). The preferred scale is located on the left side of the fish, two rows above the lateral line on the diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin. If the preferred scale is missing, select a scale within the preferred area on the other side of the fish. If no scales are present in the preferred area on either side of the fish, sample a scale as close to the preferred area as possible and darken the 8 under "age error code" on the AWL form. Do not select a scale located on the lateral line.

5. It is important to take care that scales adhere to the (gum)card, rough side up. Therefore, without turning the forceps over, clean, moisten, and mount the scale on the (gum) card with your thumb or forefinger. Exert just enough pressure to spread and smooth the scales directly over the number as shown in Appendix A.7. The ridges on the sculptured side can be felt with a fingernail or forceps. Mount scale with anterior end oriented toward top of (gum) card. All scales should be correctly oriented on the card in the same direction (Appendix A.8.).

6. Repeat steps 1 through 4 for up to 40 fish on each AWL form.

-Continued-

7. When sampling at weirs you may use "Rite in the Rain"® books to record the data. Keep the AWL forms in camp where they will be clean, dry, and flat. After sampling is done for the day, transfer the data to the AWL forms. **Each length, sex, and scale must correspond to a single fish! It is the responsibility of the crew leader to be sure the data has been transcribed correctly and the AWL forms filled out completely. Log books containing length and sex data should be returned to Matt Foster at the end of the season**. These are considered raw data and need to be archived. If you choose to record raw data on tape, these tapes must be returned to Matt Foster.

SAMPLING CHECKLIST

OPERATIONAL PLAN	PENCILS (NO. 2)
(gum) CARDS	FORCEPS
AWL FORMS (**GREEN**)	PLASTIC CARD HOLDERS
NEOPRENE WRISTERS	CLIPBOARD
MEASURING BOARD	LOG BOOK

SOME REMINDERS

1. For greater efficiency in scale reading, mount scales with anterior end toward top of (gum) card.

2. AWL forms should be carefully edited. Remember, use the new AWL forms (green) as the red and blue forms are outdated. Re-check header information on AWLs; make sure all available information is filled in. Take extra care to use the correct period code (sampling week) for the sampling or catch date. AWL numbers should not be repeated; a frequent error is to begin a week's sample with the last AWL number used the week before. This is particularly important if the data is regularly sent to town; it is easy to forget which AWL numbers were used. Crew leaders should take time to ensure that the circles are being blackened correctly. If the circles are sloppily marked, the optical scanner records the information incorrectly or misses it entirely.

-Continued-

3. Transfer important comments from the scale (gum) cards to the AWLs. After pressing scales, the cards are seldom referred to again, and important remarks can be lost. Write comments in the top right margin. If there is not room on the AWL to completely explain the remarks, use a separate piece of paper.

4. Never put data from different dates on one AWL or one (gum) card. Even if only one scale is collected that day, begin a new AWL and (gum) card the next day.

5. If weights are taken, they may be noted in the right margin of the AWL during sampling, but be sure to transfer the weights and litho code to the appropriate columns on the reverse of the AWL before submitting it to your supervisor.

6. Try to keep the litho codes (located in the left margin of the AWL) in numerical order. This should not be hard to do if they are arranged that way before page numbering. When sampling different areas throughout the season, arrange the litho codes in order before each sample is taken.

7. If AWLs get wrinkled or splotched they should be transcribed onto a new AWL prior to sending in. The optical scanning computer will misread or reject torn or wrinkled sheets. <u>Do not</u> use paperclips on AWL forms.

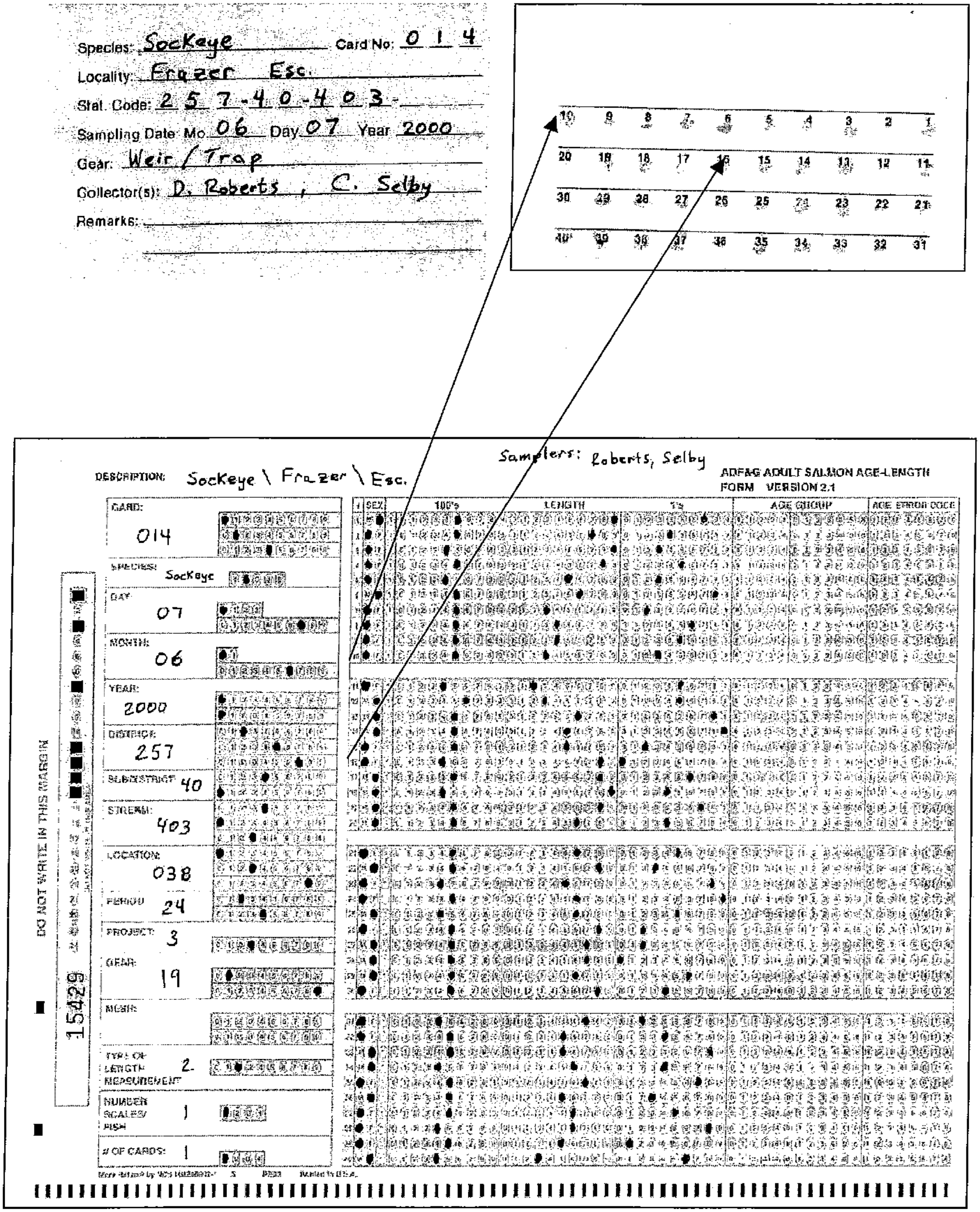
8. Be careful when collecting and mounting scales in wet conditions (rain, high humidity, etc.). If glue dries on top of the scale, it often obscures scale features, resulting in an unreadable scale. In addition, scales frequently adhere poorly to a wet (gum) card. Protect the cards and keep them dry to avoid having to remount the scales on a new card. If the cards get wet, try to dry them in a protected area or remount if necessary. <u>Remember, use a pencil when filling out (gum) cards, because ink will come off during pressing</u>.

9. Scan the AWL form for mistakes. A common error occurs, for instance, in placing both the 4 and 7 of a 475mm fish in the 100s column with nothing in the 10s column.

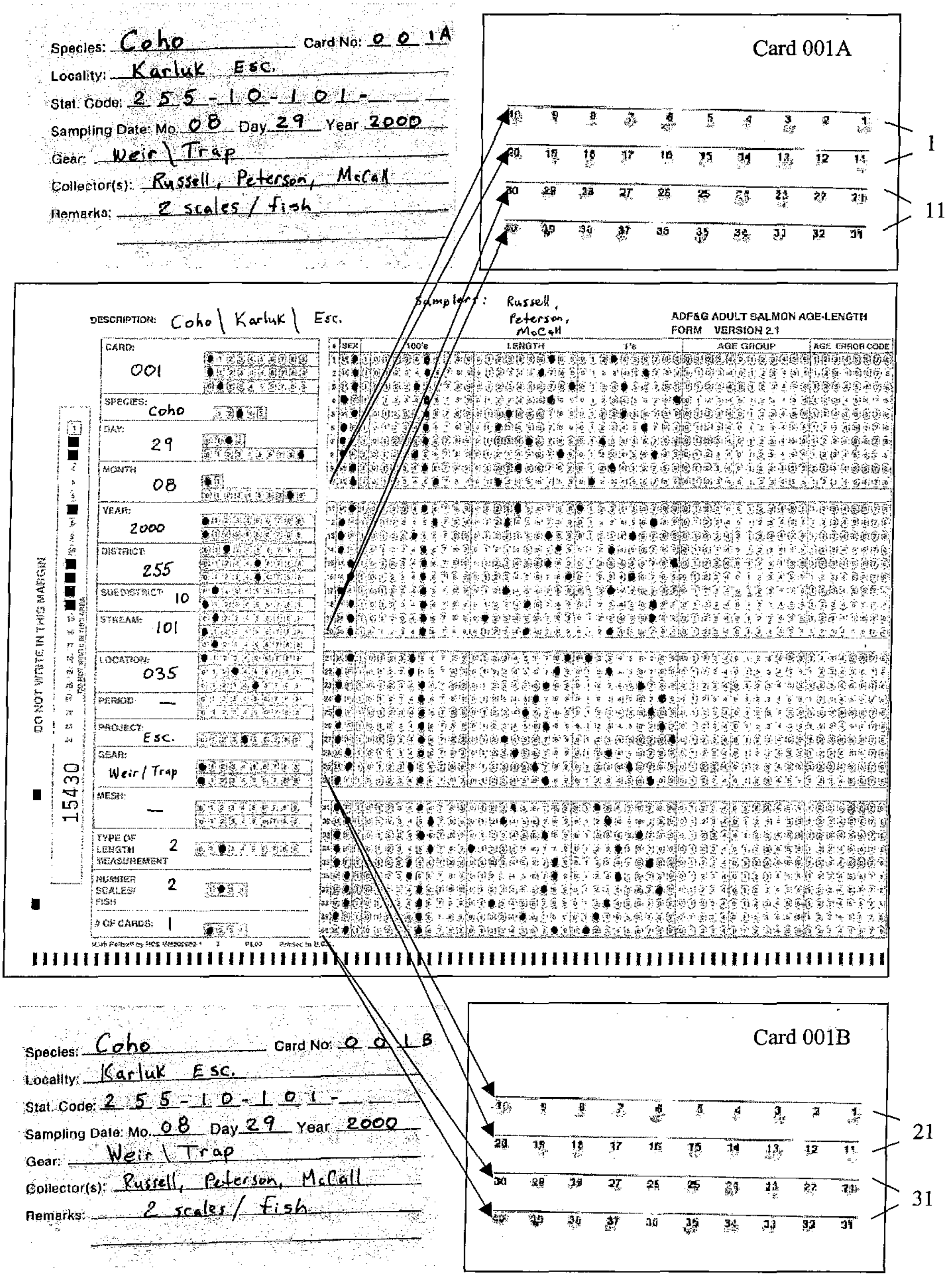
10. Avoid accumulation of incomplete AWL forms. In previous years, there have been cases where individuals have completed several samples before transcribing the information on the AWL forms. This may lead to an increase in errors. After a sample has been completed, try to get the AWL forms filled out as soon as possible. This will ensure more accurate information, as any problems or abnormalities concerning the sample (i.e., many jacks in sample, many fish lacking preferred scale, number of scales do not match number of lengths recorded, etc.) will be fresh in your mind.

11. Responsibility for accuracy lies first with the primary data collector(s) and finally with the crew leader. Sloppy or incomplete data forms or (gum) cards will be returned to individual collectors for correction.

Appendix A.3. Completed AWL (front side) and salmon scale (gum) card.



Appendix A.4. Completed AWL (front side) and salmon scale (gum) card when sampling 2 scales per fish.

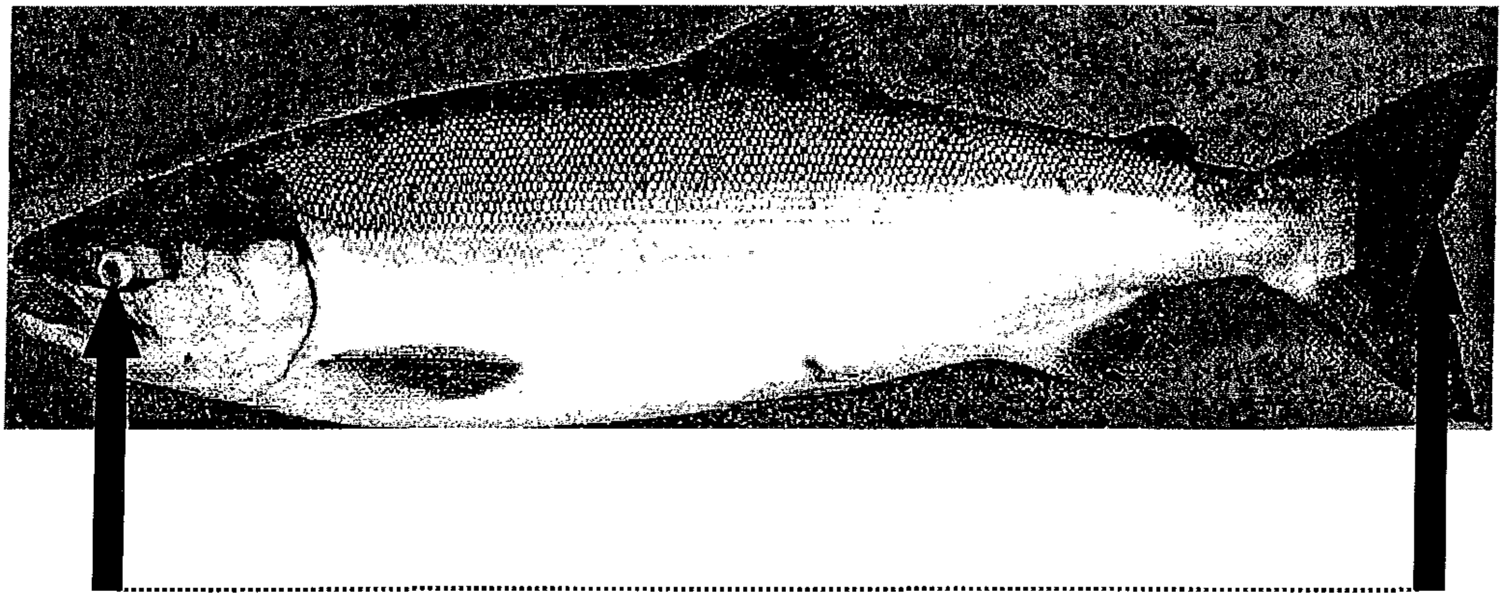


Appendix A.5. Assigned port and weir location codes.

Port and Location Codes

029	Uganik
030	Lazy Bay
031	Port of Kodiak
032	Pauls Lake
033	Thorsheim
034	Afognak River
035	Karluk River
036	Ayakulik (Red River)
037	Upper Station
038	Frazer Lake
039	Dog Salmon
040	Akalura River
041	Uganik River
042	Malina Creek
043	Portage Lake
044	Foul Bay (FBTHA)
045	Larsen Bay
046	Spiridon (SLTHA)
047	Little Kitoi
048	Waterfall Bay (WBTHA)
049	Little River
050	King Cove
051	Port Moller
052	Dutch Harbor
053	Akutan
054	Sand Point
055	Bear River
056	Nelson River
057	Canoe Bay
058	Ilnik Lagoon
059	Orzinski River
060	Sandy River
061	Thin Point Lagoon
062	Middle Lagoon
070	Black Lake
071	Chignik Weir
072	Chignik (Processing facilities)

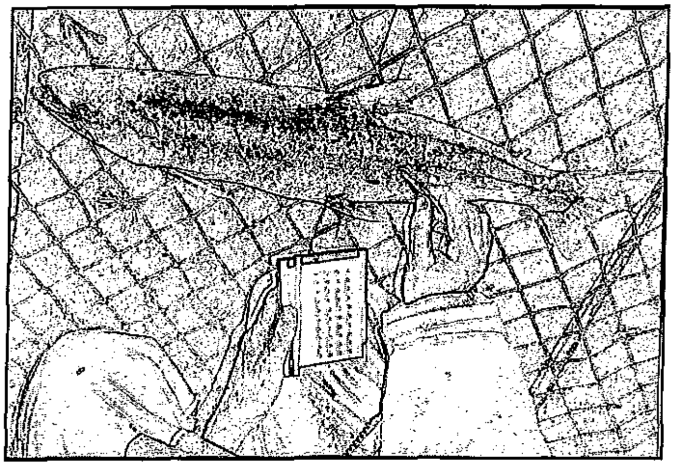
Appendix A.6. Measuring fish length from mid eye to tail fork.

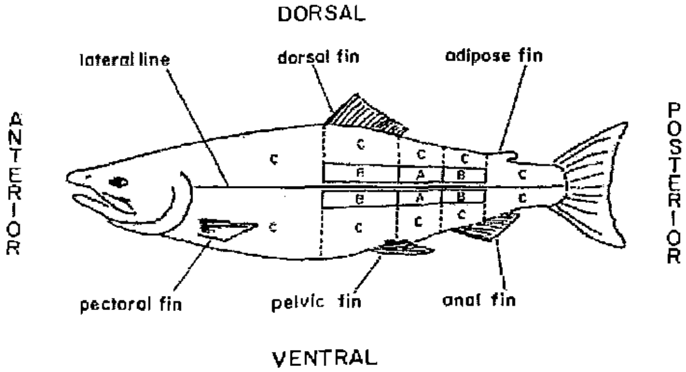


Mid eye to tail fork lengths are taken because the shape of the salmon's snout changes as it approaches sexual maturity. The procedure for measuring by this method is as follows.

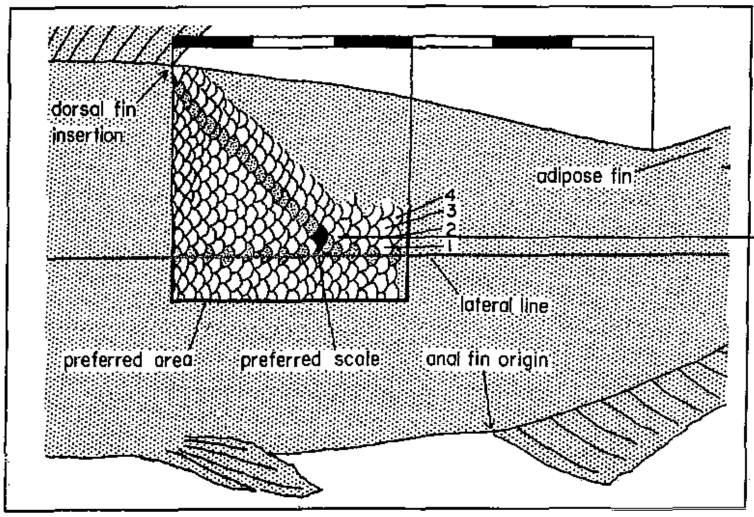
1) Place the salmon flat on its right side (on the measuring board) with its head to your left and the dorsal fin away from you.
2) Slide the fish in place so that the middle of the eye is in line with the edge of the meter stick and hold the head in place with your left hand.
3) Flatten and spread the tail against the board with your right hand.
4) Read and record the mid eye tail fork length to the nearest millimeter.

Appendix A.7. Removal and mounting of the preferred salmon scale.



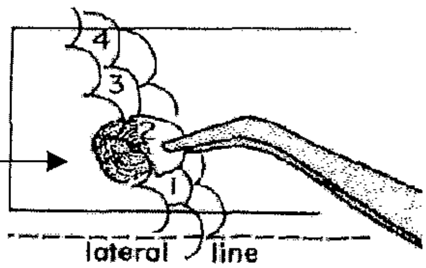


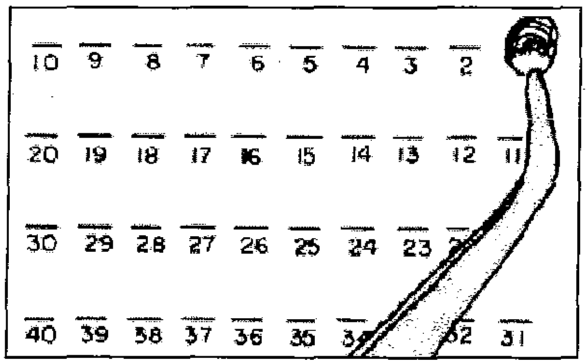
INPFC rated areas for scale removal. Area A is the preferred area. Area B is the second choice if there are no scales in area A. Area C designates non preferred areas. If scales on the left side are missing, try the right side.



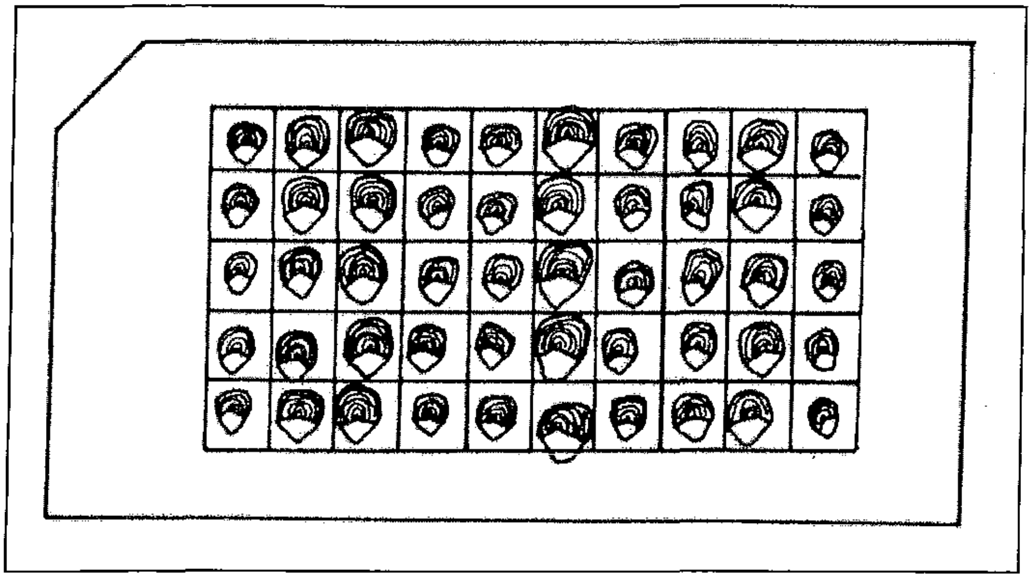
The preferred scale in this diagram is solid black. It is located 2 rows up from the lateral line, on a diagonal from the insertion (posterior) of the dorsal fin "back" toward the origin of the anal fin.

Do not turn scale over.

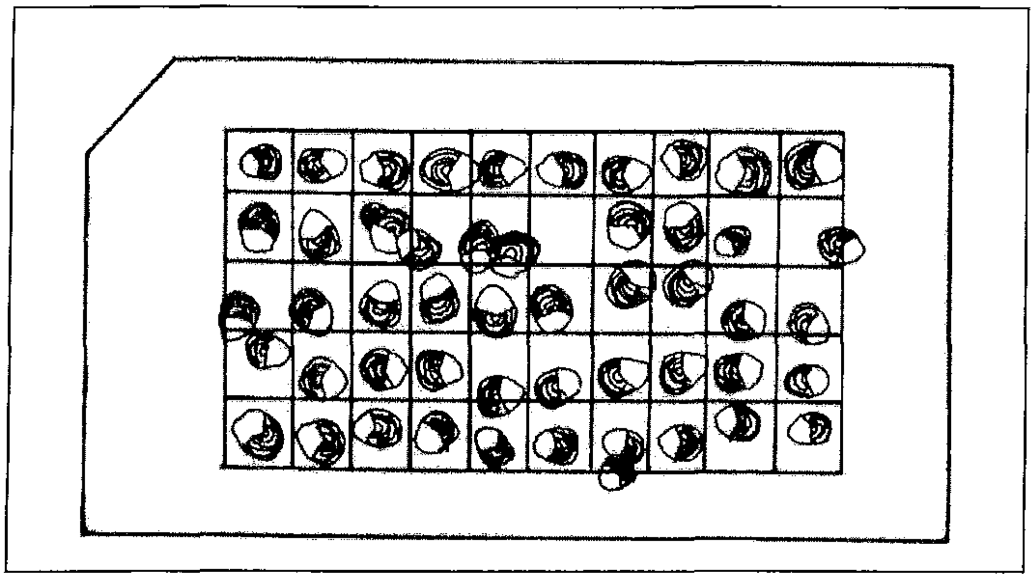




Appendix A.8. Scale orientation on the salmon scale (gum) card.



The scales are all correctly oriented on the card in the same direction, with the anterior portion of the scale pointed toward the top of the card.



The scales are incorrectly oriented in different directions. This increases the time spent to age samples.

ALITAK BAY SOCKEYE SALMON TEST FISHERY OPERATIONAL PLAN, 2002

By

Matt Birch Foster

Alaska Department of Fish and Game
Division of Commercial Fisheries
211 Mission Road
Kodiak, Alaska 99615

April 2002

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INTRODUCTION

In the Kodiak Management Area's (KMA) Alitak Bay District, there are two principal early sockeye salmon *Oncorhynchus nerka* runs, Upper Station (Olga Lakes) and Frazer Lake (Dog Salmon Creek). Both runs contribute to economically important commercial salmon fisheries, predominantly occurring in the Alitak Bay District during June and July. Sockeye salmon are harvested using both gillnet and purse seine with gear separation by fishing section (Figure 1). The 2001 estimated total sockeye salmon runs were 403,391 for Frazer Lake, 158,648 for Upper Station early run, and 135,015 for Upper Station late run (Spalinger et al. 2002; Tables 1–3). The 2002 total sockeye salmon run forecasts for Frazer Lake and Upper Station (early and late runs) are 522,000, 89,000 and 352,000 fish respectively (Eggers 2002; Tables 4–6).

A reliable inseason run strength indicator for the Alitak Bay District is necessary to ensure optimum escapement while maximizing harvest potential in traditional fishing sections. Prior to 1986 (and the establishment of the test fishery) the inseason methods for assessing run strength included sockeye salmon escapement counts at the Dog Salmon and Upper Station weirs, aerial surveys of escapement buildup on the Dog Salmon flats, and the 9 June Alitak Bay District commercial sockeye salmon catch. This information was not always timely enough to ensure maximum harvest of surplus production in traditional fishing areas and the achievement of optimum escapement objectives. Salmon bound for both Upper Station and Frazer Lake may mill on Dog Salmon flats prior to stream migration (Sagalkin and Swanton 2000). An inseason test fishery at the head of Moser Bay, in conjunction with abundance indices from the Alitak Bay District commercial fishery, provide a more timely and accurate gauge of the run strength and timing of the Frazer Lake and Upper Station early run sockeye salmon stocks.

At the January 2002 Alaska Board of Fisheries (BOF) meeting, the board passed several amendments in an effort to accomplish specific allocation objectives for the Alitak Bay District (Brennan et al. 2002). The Moser-Olga Bay Section was split into three separate gillnet-only sections: 1) Alitak Bay 2) Moser Bay and 3) Olga Bay (Figure 1). Historically, Moser and Olga Bays were combined into one commercial fishing statistical area. In an attempt to restore historical catch allocation in the Alitak Bay District, the BOF also passed an amendments that provided more fishing time for Olga Bay gillnetters and less fishing time for Moser and Alitak Bay gillnetters and Cape Alitak seiners (Brennan et al. 2002). This was accomplished with differential fishery opening times between the sections. Refer to current Alaska Administrative Code (AAC) sections: 5 AAC 18.200, 5 AAC 18.330, 5 AAC 18.331, and 5 AAC 18.361 for complete regulation listings.

GOAL

The goal of the Alitak Bay test fishery is to provide data to aid the Alaska Department of Fish and Game's (ADF&G) management of the Alitak Bay District commercial salmon fishery.

OBJECTIVES

The objectives of the Alitak Bay test fishery are as follows:

1. Provide KMA management staff with a daily index of the strength and timing of the sockeye salmon migration into Olga Bay.

2. Estimate the age and length of the test fishery catch.

3. Model the passage of sockeye salmon through Olga Narrows.

TASKS

The major tasks to be completed by the Alitak Bay test fishery crew are as follows:

1. Fish a 50 fathom 4.75 inch mesh (stretched measure) set gillnet with 20 fathom lead three hours daily at high tide, during daylight hours, between 29 May and 31 July.

2. Enumerate the salmon catch from the Alitak Bay test fishery.

3. Sample the daily test fish catch for age and length.

PROCEDURES

Test fishing will be conducted daily from 29 May through 31 July on the northeast side of Chip Cove in Moser Bay (Figure 2). A 50 fathom, 40 mesh deep, 4.75 inch mesh set gillnet attached to a 20 fathom lead will be fished with a three hour soak time. Daily, each set will commence 1.5 hrs. before high tide and terminate 1.5 hrs. after high tide. The strategy is to fish every other high tide with the exception of fishing between sunset and sunrise. When a high tide at night falls within the sequence, the previous high tide will be fished, and the sequence of fishing every other tide will re-start from that tide. The time of sunrise, sunset, and high tides for the test fishery will be determined using the diurnal and tidal fluctuations for Moser Bay at Trap Point (Table 7–9).

All sockeye salmon captured in the gillnet will be counted, transferred to an ice-filled cannery tote, and sampled once the gillnet has been removed from the water. Refer to the KMA Salmon Catch Sampling Operational Plan (Witteveen and Foster 2002) for specifics on sampling sockeye salmon. In addition, a tally of fish species, soak time (in minutes), meteorological data, and fishing conditions will be recorded on the *Alitak Bay Test Fishery catch and conditions Form* (Figure 3).

The catch will subsequently be sold to the processing facility in Lazy Bay (Figure 1) or to tenders anchored in Moser or Olga Bay's. Fish ticket receipts will be issued to the State of Alaska, Department of Fish and Game, Division of Commercial Fisheries, Kodiak. Care must be taken to ensure product quality. To avoid spoilage and loss of freshness, fish are to be held in ice until delivery (except during sampling). If inclement weather produces hazardous conditions for transit between Lazy Bay and Chip Cove, the trip will be delayed until the following day or until conditions improve. The test fishery crew will exclusively use the navigational route outlined in Figure 2. The crew leader will stay informed on the weather forecast and load extra ice at Lazy Bay when poor weather is predicted.

The equipment used in the test fishery will be maintained throughout the season. Each day, the gillnet will be inspected, cleaned, and repaired as required to ensure the net is in good fishing condition. The work skiff will be kept clean of debris and organized, with all tools and articles stowed when not in use. The 115-horsepower and spare 15-horsepower Yamaha outboards will be checked daily for any signs of potential mechanical failure. Spark plugs, propellers, fuel filter, four-stroke oil, extra fuel hose, tool kit, laminated chart, VHF radio, and emergency flares will be carried in the skiff and United States Coast Guard approved flotation devices worn at all times in the skiff.

When time and logistics permit, the test fishery crew will sample the commercial sockeye salmon catch at the Wards Cove Packing cannery. Matt Foster will coordinate any sampling efforts and inform the test fishery crew of sampling opportunities. Scale "gum" cards, sampling forms (AWLs), and catch and condition forms will be sent (via the mail plane) on a weekly basis to the Kodiak office (labeled: "attn: Matt Foster). The Kodiak office will be contacted by telephone (486-1857) to coordinate pickup of data.

The ADF&G cabin at Lazy Bay and the facility at Chip Cove will be maintained and kept orderly in appearance. The public frequently notices the condition of the field cabins and it is important for these camps to be presented properly. Camp inventory will be taken at the beginning and the end of the field season and a supply check will be performed weekly. All equipment orders will be phoned into the Kodiak office as needed, and grocery orders will be faxed to Matt Foster (486-1841) on a biweekly basis. A weekly "grocery extras" allotment ($25) will be allowed at the Wards Cove Packing grocery store at Lazy Bay.

The Alitak Bay Test Fishery crew leader will coordinate all duties to be completed in a 7.5 hour day. Any overtime must be pre-authorized by Matt Foster. The crew will take 2 days off a week, normally in conjunction with a commercial fishery opening when test fishery catch is minimal. Time sheets will be filled out daily and faxed to the Kodiak office on the 15th and 30th of every month (in conjunction with the grocery orders). The timesheets must be signed and dated by the employee prior to faxing.

REPORTING

Daily test fish data will be communicated to Kevin Brennan or Jeff Wadle in the Kodiak office via single side band radio (frequency 3.230 MHz) during the morning radio schedule (between 0800 and 0830 hours). In addition to the daily test fish data, daily phone contact (from Lazy Bay only) will be made with Matt Foster or Mark Witteveen (486-1857 or -1855). If phone contact cannot be established, the crew will contact the Kodiak office using the single side band radio. Matt Foster will be responsible for entering the test fishery data into spreadsheets and expediting this information to Lazy Bay where it will be posted for the commercial fisherman at Alitak and Moser Bay. The test fishery data will be posted on the ADF&G Alitak Bay test fishery website as well (http://www.cf.adfg.state.ak.us/region4/finfish/salmon/kodiak/alitak.htm).

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Table 1. Frazer Lake (Dog Salmon Creek) sockeye salmon estimated catch by area, escapement, and estimated total run by age class, 2001.

		Ages											
		1.1	1.2	2.1	1.3	2.2	3.1	2.3	3.2	4.1	2.4	3.3	Total
Estimated Catch by Area													
Cape Alitak Section													
	Percent	0.1	3.1	0.1	23.7	8.5	0.0	56.6	2.8	0.0	0.1	4.9	100.0
	Numbers	95	2,512	84	19,049	6,799	0	45,410	2,269	0	72	3,928	80,218
Moser-Olga Bay Section													
	Percent	0.0	2.6	0.0	19.9	7.7	0.0	61.0	3.2	0.0	0.1	5.6	100.0
	Numbers	0	4,216	0	31,794	12,263	0	97,361	5,070	0	99	8,915	159,718
Total Estimated Frazer Catch													
	Percent	0.0	2.8	0.0	21.2	7.9	0.0	59.5	3.1	0.0	0.1	5.4	100.0
	Numbers	95	6,728	84	50,843	19,061	0	142,771	7,339	0	171	12,843	239,937
Dog Salmon Escapement													
	Percent	0.2	1.0	1.0	18.9	8.4	0.0	66.4	2.4	0.0	0.0	1.8	100.0
	Numbers	272	1,599	1,555	30,834	13,725	26	108,585	3,945	9	16	2,890	163,455
Total Run	Percent	0.1	2.1	0.4	20.2	8.1	0.0	62.3	2.8	0.0	0.0	3.9	100.0
	Numbers	367	8,327	1,639	81,677	32,786	26	251,356	11,284	9	187	15,733	403,391

Table 2. Olga Lakes (Upper Station) early-run sockeye salmon estimated catch by area, escapement, and estimated total run by age class, 2001.

		Ages									
		1.1	1.2	2.1	1.3	2.2	3.1	1.4	2.3	3.2	Total
Estimated Catch by Area											
Cape Alitak Section											
	Percent	0.0	0.8	0.7	56.3	30.4	0.0	0.4	10.9	0.4	100.0
	Numbers	1	188	167	12,945	6,992	0	98	2,507	84	22,983
Moser-Olga Bay Section											
	Percent	0.0	0.9	0.0	52.8	31.5	0.0	0.6	13.6	0.5	100.0
	Numbers	0	602	0	36,397	21,728	0	393	9,382	367	68,870
Total Estimated Upper Station Early-Run Catch											
	Percent	0.0	0.9	0.2	53.7	31.3	0.0	0.5	12.9	0.5	100.0
	Numbers	1	791	167	49,342	28,720	0	491	11,890	451	91,853
Upper Station Early-Run Escapement											
	Percent	0.0	0.3	3.4	47.6	34.8	0.0	0.0	13.5	0.4	100.0
	Numbers	5	187	2,272	31,814	23,215	4	1	9,048	249	66,795
Total Run	Percent	0.0	0.6	1.5	51.2	32.7	0.0	0.3	13.2	0.4	100.0
	Numbers	6	978	2,439	81,156	51,935	4	492	20,938	700	158,648

Table 3. Olga Lakes (Upper Station) late-run sockeye salmon estimated catch by area, escapement, and estimated total run by age class, 2001.

		Ages 1.1	0.3	1.2	2.1	1.3	2.2	3.1	1.4	2.3	3.2	Total
Estimated Catch by Area												
Cape Alitak Section												
	Percent	0.1	1.6	4.7	0.2	21.6	56.5	0.0	1.1	14.1	0.2	100.0
	Numbers	13	333	953	36	4,392	11,505	0	227	2,861	41	20,361
Moser-Olga Bay Section												
	Percent	0.0	0.5	1.0	0.0	10.6	76.5	0.0	0.0	10.8	0.6	100.0
	Numbers	0	219	415	0	4,250	30,804	0	0	4,331	228	40,247
Total Estimated Upper Station Late Run Catch												
	Percent	0.0	0.9	2.3	0.1	14.3	69.8	0.0	0.4	11.9	0.4	100.0
	Numbers	13	552	1,369	36	8,642	42,309	0	227	7,191	269	60,607
Upper Station Late Run Escapement												
	Percent	0.1	0.5	2.0	15.9	9.2	62.6	0.2	0.0	9.5	0.1	100.0
	Numbers	77	364	1,463	11,864	6,836	46,567	121	27	7,039	50	74,408
Total Run	Percent	0.1	0.7	2.1	8.8	11.5	65.8	0.1	0.2	10.5	0.2	100.0
	Numbers	90	916	2,832	11,900	15,478	88,876	121	254	14,230	319	135,015

Table 4. Sockeye salmon forecast for Frazer Lake (Dog Salmon Creek), 2002.

Forecast Area: **Kodiak, Frazer Lake (Dog Salmon River)**
Species: **Sockeye Salmon**

Preliminary Forecast of the 2002 Run:	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production:		
Total Run Estimate	522	125 – 919
Escapement Goal	140	140 – 200
Harvest Estimate	382	

Forecast Methods

The 2002 Frazer Lake (Dog Salmon River) forecast was prepared primarily by investigating simple linear regression models employing recent brood year (1981-1997) sibling relationships for three major age classes. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Ages 1.3, 2.3, and 3.2 were predicted from 1.2, 2.2, and 3.1 siblings respectively. Similar to last year's forecast, the age 1.2 versus age 1.1 sibling relationship was not significant ($P \geq 0.25$); therefore, the median return was used as the forecast estimate. Age 2.2 fish were predicted by using a simple linear regression model employing age 2. smolt emigration estimates. Minor age classes (0.2, 1.1, 0.3, 2.1, 3.1, 1.4, 2.4, and 3.3) were estimated by summing individual age class estimates by run year and using the median value (1985-2001). The variances for all of the median forecasts were calculated assuming the distribution of the mean. The total run forecast was calculated by summing individual age class estimates along with the estimate for the minor age classes. The variances associated with individual and pooled age classes were summed to calculate 80% prediction intervals.

Forecast Discussion

The 2002 forecast is about 22 thousand fish greater than the 2001 forecast (500 thousand) and about 119 thousand fish greater than the actual 2001 run of 403 thousand fish. While the 2001 run fell within the 80% prediction interval of the forecast, the estimated run was considerably lower than the point estimate and individual age class predictions were fair to poor; therefore, our confidence in this forecast is fair. The 2002 run should be composed of approximately 71% five-year-old fish and 19% six-year-old fish. If this run is realized, it will be 43 thousand fish less than the recent 10-year average run of 565 thousand fish.

The projected harvest of 382 thousand fish is based on achievement of the lower bound of the escapement goal range of 140 thousand to 200 thousand. The major age classes in the run should be 2.2 (68%) and 2.3 (19%).

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Finfish Research Biologist
Kodiak

Table 5. Sockeye salmon forecast for Upper Station early run, 2002.

Forecast Area: **Kodiak, Upper Station (Early Run)**
Species: **Sockeye Salmon**

Preliminary Forecast of the 2002 Run:	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production:		
Total Run Estimate	89	18 – 160
Escapement Goal	25	25 – 75
Harvest Estimate	64	

Forecast Methods

The 2002 Upper Station early-run forecast was prepared primarily by investigating simple linear regression models employing recent brood year (1981-1997) sibling or parent escapement relationships for five major age classes. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Age classes 1.3 and 2.3 were predicted from 1.2 and 2.2 siblings respectively. Age 1.2 fish were predicted from their parent year escapement level. Age classes 0.3 and 2.2 sibling relationships were not significant ($P \geq 0.25$); therefore, the median return was used as the forecast estimate. Minor age classes (ages 0.1, 0.2, 1.1, 2.1, 0.4, 3.1, 1.4, 3.2, 3.3, and 2.4) were estimated by summing individual age class estimates by run year and using the median value (1985-2001). The variances for the median forecasts were calculated from the mean distribution. The total run forecast was calculated by summing individual age class estimates along with the estimate for the minor age classes. The variances associated with individual and pooled age classes were summed to calculate 80% prediction intervals.

Forecast Discussion

The 2002 forecast is approximately 22 thousand fish less than the 2001 forecast (111 thousand) and about 70 thousand fish less than the actual 2001 run of 159 thousand fish. The 2001 run fell within the 80% prediction intervals of the forecast and individual age class predictions were fair; therefore, our confidence in this forecast is fair. The 2002 run should be composed of approximately 10% four-year-old fish and 65% five-year-old fish. If this run is realized, it will be 33 thousand fish less than the recent 10-year average run of 122 thousand fish.

The Upper Station early run sustainable escapement goal (SEG) range is 50 thousand to 75 thousand; however, the Alaska Board of Fisheries has adopted a 25 thousand optimum escapement goal (OEG) in the Alitak Bay District Salmon Management Plan. The projected harvest of 64 thousand fish is based on achievement of the 25 thousand OEG. Similar to the 2000 and 2001 runs, the predominant age class in the 2002 run should be 2.2 (56%).

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Table 6. Sockeye salmon forecast for Upper Station late run, 2002.

Forecast Area: **Kodiak, Upper Station (Late Run)**
Species: **Sockeye Salmon**

Preliminary Forecast of the 2002 Run:	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production:		
Total Run Estimate	352	72 – 632
Escapement Goal	150	150 – 200
Harvest Estimate	202	

Forecast Methods

The 2002 Upper Station late-run forecast was prepared primarily by investigating simple linear regression models employing recent brood year (1981-1997) sibling or parent escapement relationships for six major age classes. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Age 1.2 fish were predicted from their parent year escapement level. Age 1.3 fish were predicted from age 1.2 siblings. Age 2.2 and 2.3 sibling relationships were not significant ($P \geq 0.25$); therefore, the median return was used as the forecast estimate. In previous years age 0.2 fish were predicted from median returns and 0.3 fish were predicted 0.2 fish; however, in 2001 all age 0. fish returned at levels far below the median return estimates. Therefore, the 2002 forecast estimates for both age 0.2 and 0.3 fish were based on their lowest previously observed return. The variances of these estimates were determined from the coefficients of variation and assuming similar relative error. Minor age classes (ages 0.1, 1.1, 2.1, 3.1, 0.4, 1.4, 3.2, 3.3, and 2.4) were estimated by summing individual age class estimates by run year and using the median value (1985-2001). The variances for the median forecasts were calculated. from the mean distribution. The total run forecast was calculated by summing individual age class estimates along with the estimate for the minor age classes. The variances associated with individual and pooled minor age classes were summed to calculate 80% prediction intervals.

Forecast Discussion

The 2002 forecast is about 26 thousand fish less than the 2001 forecast (378 thousand) and about 217 thousand fish greater than the actual 2001 run of 135 thousand fish. While the 2001 run fell within the 80% prediction intervals of the forecast, the run was considerably lower than the point estimate and individual age class predictions were fair to poor; therefore, our confidence in this forecast is fair. The 2002 run should be composed of approximately 20% four-year-old fish and 71% five-year-old fish. If this run is realized it will be below the recent 10-year average run of 470 thousand fish.

The projected harvest of 202 thousand fish is based on achievement of the lower bound of the escapement goal range of 150 thousand to 200 thousand. The major age classes in the run should be 2.2 (65%) and 1.2 (20%).

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Kodiak

Tides-Moser Bay (Trap Point)

based on Kodiak, Womens Bay, Alaska (NOAA)
57° 0 N 154° 9 W

Average Tides	
Mean Range:	9.3 ft
MHHW:	11.6 ft
Mean Tide:	6.2 ft

May 2002

Monthly High & Low	
High May 27,	2:50a 14.3 ft
Low May 27,	9:59a -3.3 ft

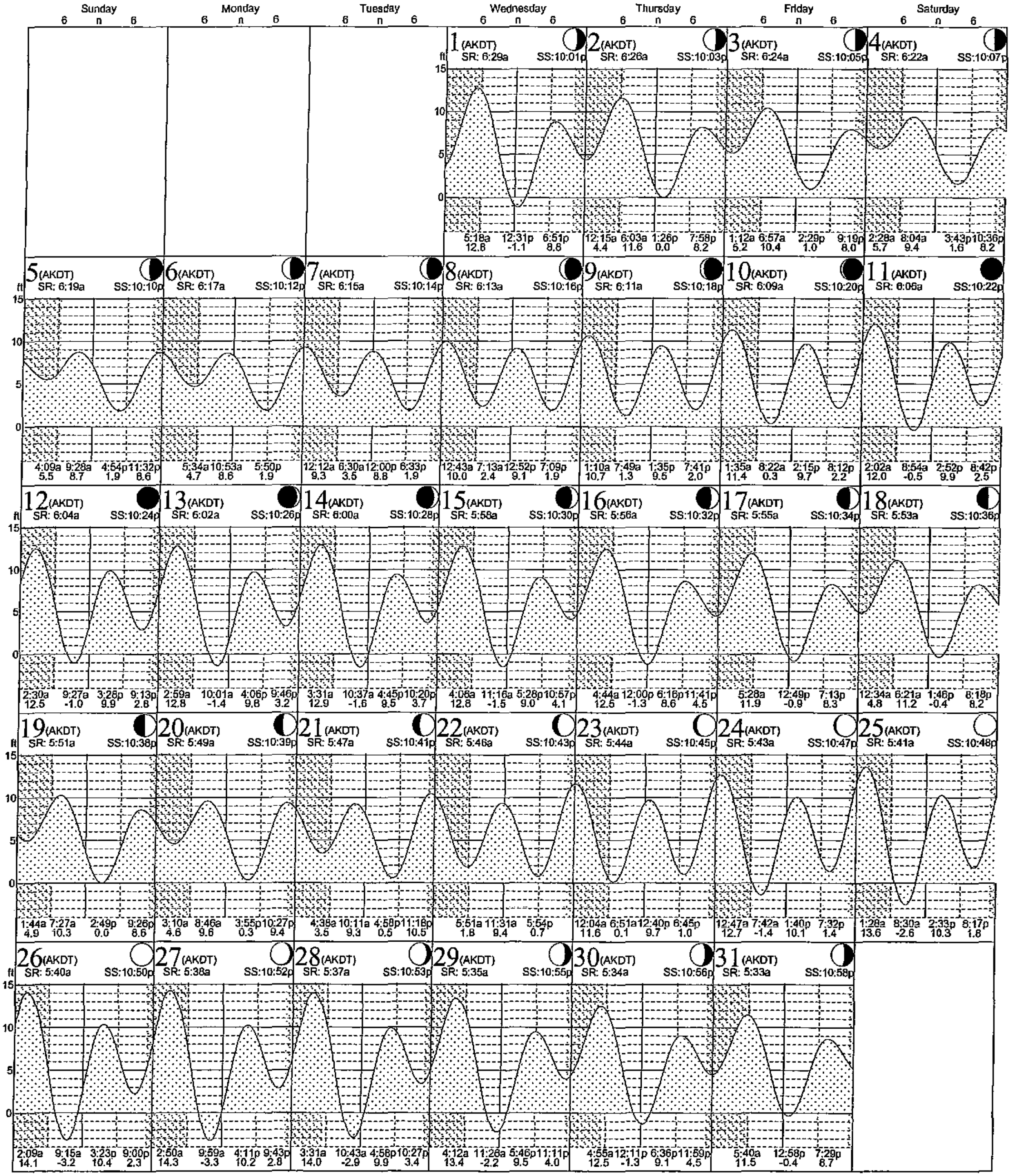

Table 7.

Tides-Moser Bay (Trap Point)

based on Kodiak, Womens Bay, Alaska (NOAA)
57° 0 N 154° 9 W

June 2002

Average Tides
Mean Range: 9.3 ft
MHHW: 11.6 ft
Mean Tide: 6.2 ft

Monthly High & Low
High June 25, 2:32a 13.8 ft
Low June 25, 9:49a -2.8 ft

Day	Weekday	Zone	SR	SS	Tide 1	Tide 2	Tide 3	Tide 4
1	Saturday	AKDT	5:32a	10:59p	12:53a 5.0	6:29a 10.3	1:48p 0.5	8:27p 8.5
2	Sunday	AKDT	5:31a	11:01p	1:59a 5.2	7:26a 9.3	2:42p 1.3	9:24p 8.6
3	Monday	AKDT	5:30a	11:02p	3:19a 5.0	8:34a 8.4	3:38p 2.0	10:16p 8.9
4	Tuesday	AKDT	5:29a	11:03p	4:41a 4.3	9:53a 7.9	4:33p 2.5	10:59p 9.5
5	Wednesday	AKDT	5:28a	11:04p	5:46a 3.3	11:10a 7.7	5:23p 2.8	11:37p 10.1
6	Thursday	AKDT	5:27a	11:06p	6:36a 2.2	12:16p 8.0	6:08p 3.1	
7	Friday	AKDT	5:26a	11:07p	12:11a 10.9	7:18a 1.1	1:10p 8.3	6:49p 3.3
8	Saturday	AKDT	5:25a	11:08p	12:45a 11.6	7:55a 0.1	1:56p 8.7	7:28p 3.5
9	Sunday	AKDT	5:25a	11:09p	1:19a 12.2	8:31a -0.8	2:38p 9.0	8:06p 3.6
10	Monday	AKDT	5:24a	11:10p	1:55a 12.8	9:08a -1.5	3:18p 9.3	8:45p 3.7
11	Tuesday	AKDT	5:24a	11:11p	2:31a 13.2	9:45a -2.0	3:58p 9.4	9:24p 3.8
12	Wednesday	AKDT	5:23a	11:11p	3:10a 13.3	10:24a -2.3	4:39p 9.4	10:04p 3.9
13	Thursday	AKDT	5:23a	11:12p	3:50a 13.2	11:06a -2.4	5:23p 9.3	10:48p 3.9
14	Friday	AKDT	5:22a	11:13p	4:34a 12.9	11:49a -2.2	6:09p 9.2	11:38p 4.0
15	Saturday	AKDT	5:22a	11:13p	5:21a 12.2	12:35p -1.8	6:58p 9.2	
16	Sunday	AKDT	5:22a	11:14p	12:35a 4.0	6:15a 11.3	1:25p -1.1	7:51p 9.4
17	Monday	AKDT	5:22a	11:14p	1:42a 3.8	7:18a 10.2	2:18p -0.3	8:46p 9.9
18	Tuesday	AKDT	5:22a	11:15p	2:59a 3.3	8:31a 9.1	3:15p 0.5	9:41p 10.5
19	Wednesday	AKDT	5:22a	11:15p	4:21a 2.3	9:54a 8.4	4:14p 1.4	10:34p 11.3
20	Thursday	AKDT	5:22a	11:15p	5:35a 1.0	11:19a 8.3	5:13p 2.1	11:26p 12.1
21	Friday	AKDT	5:22a	11:16p	6:38a -0.4	12:35p 8.5	6:11p 2.6	
22	Saturday	AKDT	5:22a	11:16p	12:15a 12.9	7:32a -1.5	1:39p 8.9	7:05p 3.0
23	Sunday	AKDT	5:23a	11:16p	1:02a 13.4	8:21a -2.3	2:33p 9.3	7:55p 3.2
24	Monday	AKDT	5:23a	11:16p	1:48a 13.7	9:06a -2.8	3:22p 9.6	8:43p 3.4
25	Tuesday	AKDT	5:24a	11:16p	2:32a 13.8	9:49a -2.8	4:06p 9.8	9:28p 3.5
26	Wednesday	AKDT	5:24a	11:16p	3:14a 13.5	10:29a -2.5	4:48p 9.7	10:12p 3.7
27	Thursday	AKDT	5:25a	11:15p	3:56a 13.0	11:09a -2.0	5:28p 9.6	10:56p 3.8
28	Friday	AKDT	5:25a	11:15p	4:37a 12.3	11:48a -1.4	6:08p 9.4	11:40p 4.0
29	Saturday	AKDT	5:26a	11:15p	5:18a 11.4	12:26p -0.6	6:47p 9.2	
30	Sunday	AKDT	5:27a	11:14p	12:28a 4.2	6:01a 10.4	1:05p 0.3	7:28p 9.2

Table 8. 15

Tides-Moser Bay (Trap Point)

based on Kodiak, Womens Bay, Alaska (NOAA)
57° 0 N 154° 9 W

July 2002

Average Tides
Mean Range: 9.3 ft
MHHW: 11.6 ft
Mean Tide: 6.2 ft

Monthly High & Low
High July 11, 2:56a 13.6 ft
Low July 12, 10:51a -3.0 ft

Date	Day	SR	SS	Tide 1	Tide 2	Tide 3	Tide 4
1 (AKDT)	Monday	5:28a	11:14p	1:21a 4.3	6:49a 9.3	1:44p 1.2	8:10p 9.2
2 (AKDT)	Tuesday	5:29a	11:13p	2:23a 4.2	7:44a 8.3	2:27p 2.1	8:53p 9.4
3 (AKDT)	Wednesday	5:30a	11:12p	3:33a 3.9	8:51a 7.5	3:14p 2.9	9:39p 9.8
4 (AKDT)	Thursday	5:31a	11:12p	4:46a 3.2	10:11a 7.0	4:07p 3.6	10:26p 10.2
5 (AKDT)	Friday	5:32a	11:11p	5:50a 2.3	11:35a 7.1	5:03p 4.1	11:13p 10.8
6 (AKDT)	Saturday	5:33a	11:10p	6:43a 1.2	12:45p 7.5	5:58p 4.4	11:59p 11.5
7 (AKDT)	Sunday	5:34a	11:09p	7:26a 0.2	1:39p 8.0	6:50p 4.4	
8 (AKDT)	Monday	5:35a	11:08p	12:44a 12.2	8:10a -0.9	2:25p 8.5	7:38p 4.2
9 (AKDT)	Tuesday	5:37a	11:07p	1:28a 12.8	8:50a -1.8	3:06p 9.0	8:24p 3.9
10 (AKDT)	Wednesday	5:38a	11:06p	2:12a 13.4	9:30a -2.5	3:45p 9.4	9:08p 3.5
11 (AKDT)	Thursday	5:39a	11:05p	2:56a 13.6	10:10a -2.9	4:24p 9.7	9:54p 3.2
12 (AKDT)	Friday	5:41a	11:04p	3:41a 13.6	10:51a -3.0	5:04p 10.0	10:41p 2.8
13 (AKDT)	Saturday	5:42a	11:02p	4:27a 13.2	11:32a -2.8	5:45p 10.2	11:32p 2.6
14 (AKDT)	Sunday	5:44a	11:01p	5:15a 12.4	12:14p -2.1	6:28p 10.5	
15 (AKDT)	Monday	5:45a	11:00p	12:27a 2.4	6:08a 11.3	12:58p -1.1	7:14p 10.8
16 (AKDT)	Tuesday	5:47a	10:58p	1:30a 2.2	7:07a 9.9	1:45p 0.1	8:03p 11.0
17 (AKDT)	Wednesday	5:49a	10:57p	2:40a 1.9	8:17a 8.7	2:36p 1.4	8:57p 11.3
18 (AKDT)	Thursday	5:50a	10:55p	3:59a 1.4	9:41a 7.8	3:34p 2.6	9:54p 11.7
19 (AKDT)	Friday	5:52a	10:54p	5:18a 0.6	11:16a 7.5	4:40p 3.5	10:54p 12.0
20 (AKDT)	Saturday	5:54a	10:52p	6:27a -0.3	12:39p 7.9	5:48p 4.0	11:53p 12.4
21 (AKDT)	Sunday	5:55a	10:50p	7:25a -1.1	1:42p 8.4	6:51p 4.1	
22 (AKDT)	Monday	5:57a	10:49p	12:47a 12.8	8:14a -1.7	2:32p 9.0	7:47p 3.9
23 (AKDT)	Tuesday	5:59a	10:47p	1:37a 13.0	8:57a -2.0	3:15p 9.5	8:35p 3.6
24 (AKDT)	Wednesday	6:01a	10:45p	2:22a 13.1	9:37a -2.1	3:52p 9.7	9:19p 3.4
25 (AKDT)	Thursday	6:03a	10:43p	3:04a 13.0	10:13a -2.0	4:26p 9.9	9:59p 3.2
26 (AKDT)	Friday	6:05a	10:41p	3:42a 12.7	10:46a -1.6	4:58p 10.0	10:36p 3.1
27 (AKDT)	Saturday	6:06a	10:39p	4:20a 12.1	11:18a -1.1	5:28p 10.0	11:17p 3.0
28 (AKDT)	Sunday	6:08a	10:38p	4:56a 11.4	11:50a -0.4	5:58p 9.9	11:58p 3.1
29 (AKDT)	Monday	6:10a	10:36p	5:35a 10.4	12:21p 0.5	6:29p 9.9	
30 (AKDT)	Tuesday	6:12a	10:33p	12:41a 3.2	6:16a 9.4	12:53p 1.4	7:03p 9.9
31 (AKDT)	Wednesday	6:14a	10:31p	1:31a 3.2	7:02a 8.4	1:27p 2.4	7:42p 10.0

Table 9.

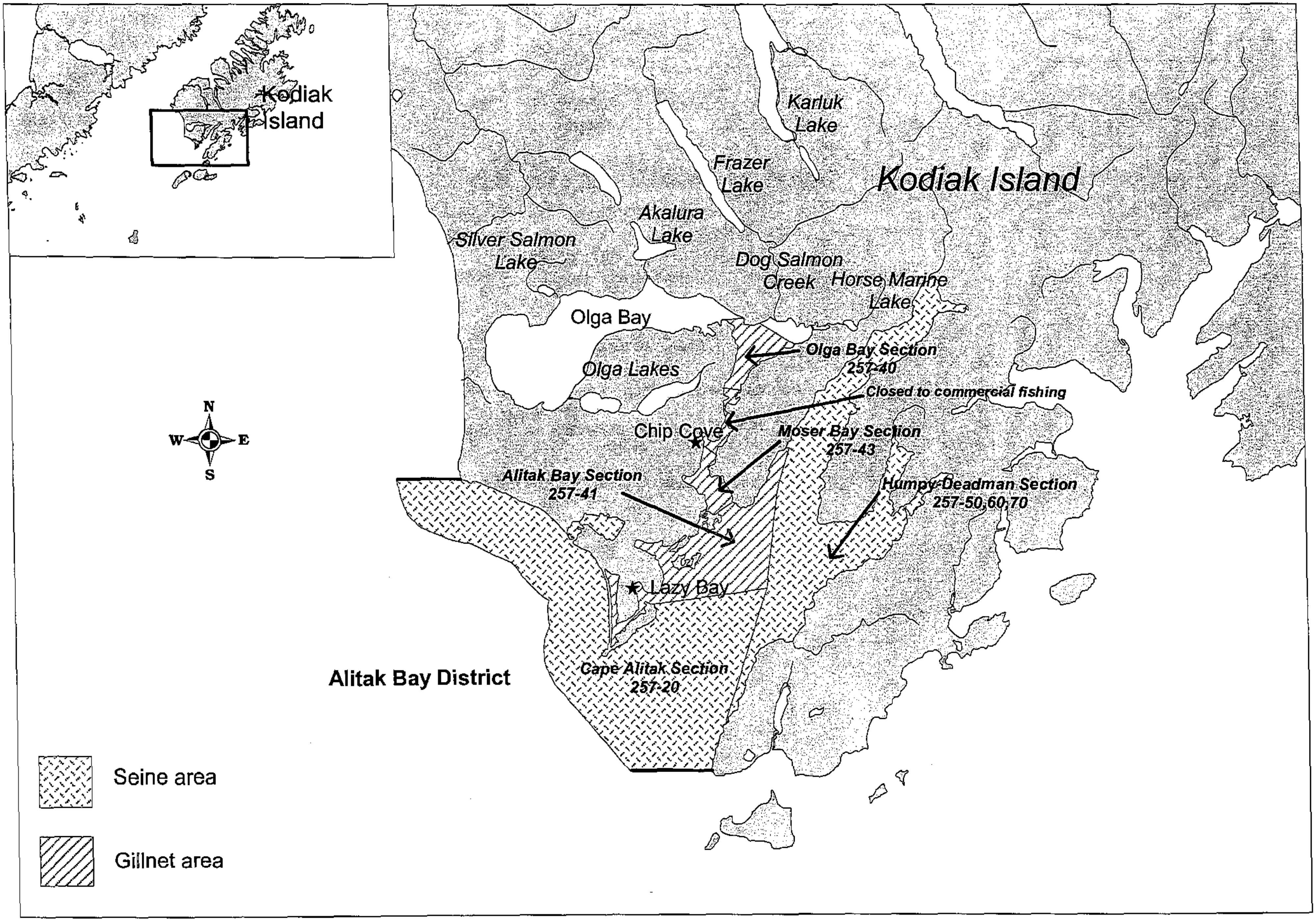

Figure 1. Cape Alitak and Moser-Olga Bay commercial salmon fishing sections and processing facility at Lazy Bay.

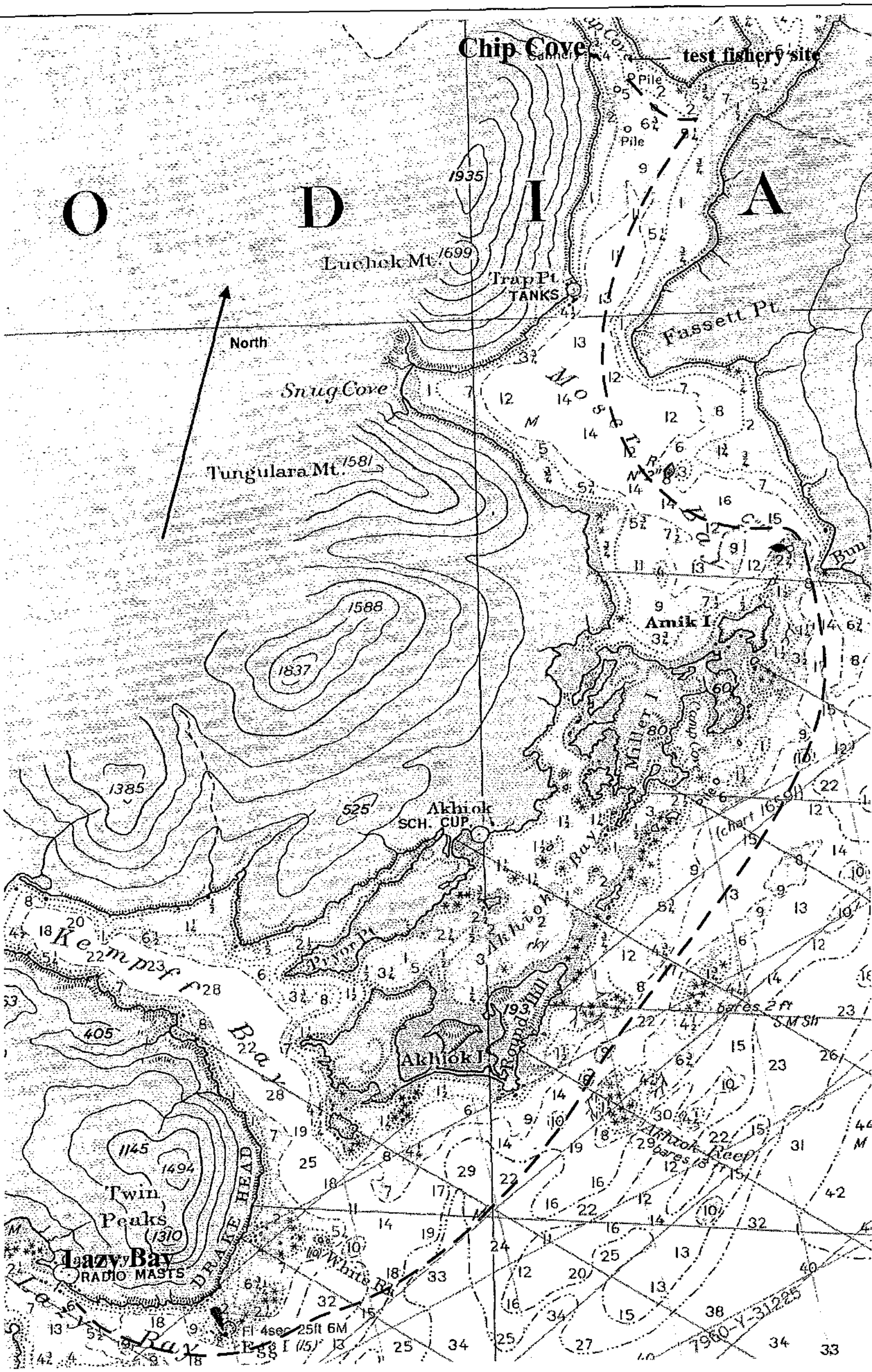

Figure 2. NOAA chart displaying the navigational route between Lazy Bay and the Chip Cove test fishery site.

Alitak Bay test fishery catch and conditions Form.

Date	Tide		Gill Net			Catch			Precip.	Wave	Wind	Temp. (Celsius)		% Cloud	Comments
	Height	Time	Set	Pulled	Soak time	Sockeye	Chum	Other	(mm)	Ht.	Dir.	Air	Water	Cover	

Figure 3. Alitak Bay Test Fishery catch and conditions form.

FRAZER LAKE
OPERATIONAL PLAN, 2002

by
Karla Granath
and
Nick Sagalkin

Alaska Department of Fish and Game
Division of Commercial Fisheries
211 Mission Road
Kodiak, AK 99615

April 2002

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INTRODUCTION

Frazer Lake is located on the southern end of Kodiak Island and is the second largest lake within the Kodiak Archipelago. Frazer Lake is 14.2 km long, 1.6 km wide, with a surface area of 16.1 km^2 (Figure 1). Dog Salmon Creek is the outlet to Frazer Lake and drains into Olga Bay. Prior to 1951, Frazer Lake was void of sockeye salmon *Oncorhynchus nerka* because of a 10-meter barrier falls, which prohibited anadromous fish from entering the lake (Russell 1972). Egg, fry, and adult transplants (1951-1971) from sockeye salmon systems on Kodiak Island (Karluk and Red Lakes) and the Alaska Peninsula (Becharof Lake) established a sockeye salmon run with adults returning for the first time in 1956 (Russell 1972). From 1956-1961, returning adults were backpacked over the falls and, in 1962, a fish pass was constructed to promote access to the lake environment. A second fish pass was installed in 1979, allowing for increased passage capacity during peak migration periods.

In 1983, a weir was installed on Dog Salmon Creek, 0.7 km upstream from lower Olga Bay. The Dog Salmon weir provided more timely sockeye and pink salmon *Oncorhynchus gorbuscha* escapement counts than the fish pass counts, which was important for managing the commercial fishery.

Conservative fishery management practices have been very successful at building the Frazer Lake run from 25,000 sockeye salmon in 1971 to 645,739 fish in 1985. Blackett (1979) established an escapement goal range of 383,000 adults based upon limnological and spawning habitat calculations. Subsequent declines in smolt condition factor, and shifts in zooplankton size and community composition demonstrated by Kyle et al. (1988) prompted lowering of the escapement goal. In 1986 the escapement goal range was lowered to 200,000-275,000 adults; goals were lowered again to 140,000-200,000 in 1988. Fertilizer (a mixture of nitrogen and phosphorous) was applied to the lake, from 1988-1992 in an attempt to stimulate survival of lake rearing sockeye fry. This program was instituted in response to dramatic declines in smolt size resulting from high escapements into the lake that occurred during 1980-1982 and 1985.

The Frazer Lake sockeye salmon stock is now considered of major importance to the island-wide salmon fishery. Also, this introduced run provides for an enhanced food resource for the local Kodiak Island brown bear population, stimulating increases in bear densities along Frazer Lake and Dog Salmon Creek streams.

Since 1956, enumeration of adults and age and length sampling has been conducted at the Frazer Lake fish pass. Spawning ground surveys have been performed since 1964. Since 1985, smolt migration timing and magnitude and zooplankton density and community composition have been measured (Sagalkin 1999; Sagalkin *in press*).

PROJECT OBJECTIVES

The Commercial Fisheries Division's goals for the Frazer Lake project are optimizing natural sockeye salmon production and collection of data relevant to generating accurate preseason run forecasts and escapement goal evaluations. For 2002, specific objectives are:

1. Determine sockeye salmon smolt abundance, timing, and age composition.
2. Provide unobstructed and timely adult fish passage into Frazer Lake.
3. Determine escapement timing, magnitude, and spawner distribution of adult sockeye salmon.
4. Collect age, sex, and length data from the adult sockeye salmon escapement, and age, length, and weight data from the sockeye salmon smolt outmigration.

SUPERVISION AND TRAINING

The project leader is Nick Sagalkin, and the fish and wildlife technician III will be the crew leader. The crew leader is responsible for scheduling daily work assignments, ensuring that collected data adheres to plan standards, and assuring that safety is priority. A brief chronology of assignments is presented in Table 1. More detail on crew leader and field crew responsibilities is presented in a later section (see 'Crew Leader Responsibilities').

SMOLT SAMPLING AND POPULATION ESTIMATION PROCEDURES

Objectives

1. Estimate the total number of outmigrating sockeye salmon smolt by age at Frazer Lake.
2. Estimate sockeye salmon smolt age composition and average smolt length, weight, and condition factor by age class.
3. Estimate the timing of the sockeye salmon smolt outmigration by age class.

Tasks

1. Operate one inclined plane trap continuously throughout the sockeye salmon smolt migration.
2. Count the daily catch by species noting the number of dyed and un-dyed sockeye salmon smolt.

3. Sample 70 sockeye salmon smolt per day, five days each week, for age, weight, and length throughout the migration.

4. One day each week conduct a mark-recapture experiment to determine trap capture efficiency.

Trap Location, Set-up, and Maintenance

A single incline plane trap (Todd 1994) will be installed approximately 100 m upstream of the fish pass diversion weir (identical location as in the 1998 study; Appendix A). After the initial set-up and evaluation, the location of the trap in the river along with the dimensions of the trap leads will be documented in the form of a scale drawing with each dimension clearly labeled. If the trap is repositioned or lead material is added or deleted, the change will be documented in the comment section of the *Daily Smolt Catch Reporting Form* (Figure 2) and a new drawing completed. In addition, trap catch efficiency will be determined as soon as possible after modifications are made (trap efficiency is described in more detail in a later section).

The trap will be checked as often as necessary to minimize any fish mortality. Minimally, the trap will be checked every 30 minutes between sunset and sunrise. During daylight hours, a check once every four hours is usually adequate. The last trap check will be conducted at the conclusion of the smolt day (1200 hours). Although smolt generally outmigrate in the evening hours, there is evidence of large smolt movements occurring in the mid-afternoon hours coinciding with major weather changes including rain storms. **It is essential that the crew keep a close watch on the smolt trap to avoid significant mortality due to crowding.**

Species Identification and Quantification of Trap Catch

There are two methods for determining the number of fish caught in a trap by species. The simplest and most common procedure is to individually count the fish by species while emptying the live-box with a dip net. This number will be recorded on *the Daily Smolt Catch Reporting Form* (Figure 2). The second method uses a catch-weight sampling procedure where the catch is transferred by dip net into a small mesh netted basket suspended over the creek from a hanging scale. This station should be set up immediately after trap placement (Appendix A). The aggregate weight of the catch is then recorded, and the process is continued until the live box is emptied. Catch-weight data should be recorded on the *Catch-Weight Sampling Form* (Figure 3). During the catch-weight sampling process, samples are taken to determine species count by weight. This involves counting the number of fish by species from a known aggregate weight obtained using a hanging scale. Generally, the rule will be to sample every tenth dip net of fish for a species count by weight. **The second method (catch-weight) will only be used when there are large numbers of smolt being caught, and there is not enough time to count all the fish without incurring fish mortalities.** It should be noted in the comments section of the daily smolt reporting form when the catch-weight method is used. The daily total should be recorded on the *Sockeye Salmon Smolt Summary Form* (Figure 4).

All catch will be identified and counted by species. Species identification keys are provided in Appendix B. Another helpful source is 'Field Identification of Coastal Salmonids' by Pollard et.

al. (1997). It is the responsibility of the crew leader to ensure that the crew use the keys to properly identify the catch.

Trap Efficiency

Once a week (or after trap modification), trap efficiency will be estimated by marking sockeye salmon smolt, releasing these smolt, and counting the number of recaptured smolt. Marking is accomplished using Bismark Brown Y (BBY) dye. The dyeing process can be stressful on sockeye salmon smolt, which is important to keep in mind at all times during the procedure. Minimizing unnecessary stress is the key in the dyeing process. Excessive handling (netting), elevated water temperature, and exposure to the dye itself are the primary stress factors. All of these can induce mortality alone, so if one or more of these are combined, significant mortality may occur. Timing of the process should be late afternoon/early evening (1900-2100 hours). Again, if modifications are made to the trap, that might affect trap efficiency, conduct a test as soon as possible. The following steps should be followed to minimize mortality and ensure valid results:

1. **Collect 1,100 to 1,125 sockeye salmon smolt.** Collect sockeye salmon smolt once per week for the dye test, preferably on large outmigration days. If you are unable to collect 1,100 smolt in a single night, you may need to collect fish over two days. Do not hold smolt for more than three consecutive nights when trying to collect the 1,100 for marking. **It is better to perform the test on a smaller number of fish than to hold fish for a longer duration.** A minimum of 300 smolt (250 for release and 50 for monitoring) should be used if an extended collection time is required. Record the time, water temperature, and number of smolt collected on the *Smolt Dye Release Form* (Figure 5).

2. **Set up dyeing station at release site.** The release site will be the identical location used during 2001 (consistent site since 1996; approximately ½ mile upstream). A holding box will be placed in the stream, preferably in a "pool" area, while marking smolt. Assemble other marking equipment: 30 gallon garbage can or tote, BBY dye, supplemental oxygen (0_2 bottle, regulator, tubing, air stone), aerators, thermometer, and log book.

3. **Move smolt to release site.** Use three or more buckets to hold the smolt (approx. 200-250 smolt per bucket). An aerator ("bubbler" or supplemented oxygen) should be used to aerate the water in each bucket and lids secured with duct tape prior to transport. It is important to be efficient when moving the smolt to the release site. Record the water temperature from the live box and in the transport bucket prior to bringing the smolt to the release site.

4. **Dye and release smolt.** Upon reaching the release site, hold the smolt in a live box or tote anchored in the stream for a minimum of 30 minutes. Record the water temperature at the start of the recovery period and any mortality at the end of the recovery period. If the stream temperature is >8° C or there are obvious signs of stress, oxygenate the water using the portable aerators and/or oxygen bottle. For dying the smolt, use 1 gram of BBY dye per 30 liters (8 gallons) of water. Mix water (15 gallons) and dye (1.9g) in a 30-gallon container. Use an aerator and supplemental oxygen to maintain the oxygen level. Record the water temperature in the dye container. Using a dip net, place the smolt into the dye/water mixture for 30 minutes. Keep the dye container (with the lid on) in the stream to maintain ambient

water temperature and record any mortality that occurs. After the smolt are dyed, place them into the instream holding box until release, which should occur between 2200 and 2300 hours. At the time of release, transfer only the robust smolt to water filled buckets and release them evenly across the stream. Record the number of healthy smolt released, time of release, water temperatures, and other data on the *Smolt Dye Release Form* (Figure 5). Retain at least 100 robust and healthy smolt in the instream live box (record the actual number on the *Smolt Dye Release Form*, Figure 5). To prevent bird or otter predation on retained smolt, make sure to anchor and cover the box securely. All sick and dead smolt should be disposed of in a manner that will not attract animals or influence trap catches.

5. **Examine for marked smolt.** Examine the smolt catch, following the release of dyed smolt, for marked fish until the day of the next test. The first day of smolt examination is the day of release. The last smolt examination should occur on the day of the next release at 1200 hours. Trap efficiency is measured by the number of marked fish recovered relative to the number released. Record mark recapture data on the *Daily Smolt Catch Reporting Form* (Figure 2), and summarize the data on the *Sockeye Salmon Smolt Summary Form* (Figure 4). Remember that the number of smolt examined in a day equals marked and un-marked smolt caught that day. Daily smolt catch should equal the number examined minus the number marked because marked smolt were previously counted. If all fish are not examined, be sure to record it with an explanation in the comments section of the *Daily Smolt Catch Reporting Form* (Figure 2).

   There might be occasions when all the smolt are not individually counted. These will be limited to the following: 1) too many smolt outmigrating to safely count individually without incurring mortality (i.e., using catch-weight methods) or 2) a problem with the trap. If all fish are not examined, be sure to record it with an explanation in the comments section of the *Daily Smolt Catch Reporting Form* (Figure 2).

6. **Monitor the instream live box for smolt mortalities.** Once each evening for three days at approximately 1800 hours, count and remove any dead smolt in the instream holding box. Attempt to do this quickly and without stressing the smolt unnecessarily. Record the number of dead smolt on the *Smolt Dye Release Form* (Figure 5). On the fourth day after initiating a dye test, release the remaining dyed smolt in the instream live box downstream of the trap.

Age, Weight, and Length Sampling

Seventy sockeye smolt per day should be sampled for age, weight, and length, five days per week. If daily sampling objectives are being met, sampling will not occur on Wednesday and Sunday. Specific procedures for collecting and recording the information is in Appendix C. Each sample should be taken from a single day's catch. Do not mix samples between days. If less than 70 fish are caught in a day, the sample size for that day will be the number of fish caught on that day. If 70 fish are sampled, the first AWL will include fish #1-40. The following AWL will include fish #1-30 (not #41-70). Smolt primarily migrate at night, so a single sampling day will be the 24-hr. period from noon to noon and will be identified by the calendar date corresponding to the first noon.

Climate Data

Climatological data should be collected daily at approximately 1800 hours. The information should be recorded on the *Climatological Observation Form* and will include water and air temperatures (°C), stream height (cm), estimated percent cloud cover, and wind direction and velocity (Figure 8). Stream height will be measured from a stream gauge in the stream in a location not directly affected by the trap, generally upstream a few meters.

Termination of Smolt Estimation

The smolt trap at Frazer Lake will be removed at the end of the smolt migration, which is expected to be approximately 30 June. The exact date for trap removal will be determined by Mr. Sagalkin based on trap catch rate performance compared to previous years and consultation with the field crew.

FISH PASS OPERATION AND ADULT SAMPLING

Objectives

1. Enumerate adult salmon escapement and estimate the adult sockeye salmon escapement by age class into Frazer Lake.

2. Estimate sockeye salmon age composition, average length, and sex ratios by age class.

3. Monitor escapement quality with respect to numbers of net-marked and "jack" sockeye salmon.

Tasks

1. Operate the old fish pass continuously until a decision to close the fish pass is made by the project biologist.

2. Count the daily escapement by species, noting the number of net-marked and "jack" sockeye salmon.

3. Sample 80 adult sockeye salmon three times per week for age, length, and sex.

4. Beginning in mid-July and extending through August conduct lake and stream surveys to document distribution and spawning abundance patterns.

5. Sample for zooplankton in Frazer Lake monthly from May through the termination of the project.

Fish Pass Procedures

The old fish pass should be operated from approximately 15 June through 21 August, with the starting date scheduled to minimize smolt passage through the fish pass. The diversion weir should be installed prior to 21 May. Fish pass operations will begin the day after sockeye salmon are first counted through Dog Salmon weir. The 'new fish pass' will only be used after consulting with the project leader. The new fish pass has not been used for fish passage since about 1986. Diversion weirs above and below the Frazer falls should be inspected daily for holes and cleaned when required. Specific instructions for fish pass maintenance and operation are provided in Appendix D. These steps prevent fish from escaping above the lower diversion weir, which has been a major problem in the past. All weir panels on the lower diversion weir should be wired tightly together at the base and secured to the tripods using boards. All gaps between the weir panels greater than about 76 mm (1.5 inches) should be covered with perforated plate, and holes at the base of the weir should be blocked with sandbags or large rocks. This is important because fish that escape through the lower diversion weir become trapped at the base of the falls. To reduce erosion, the bottom of the fish pass entrance should be covered with large rocks (not sandbags).

Escapement counting frequency will be scheduled to minimize migration delay. Specifically, counts will be made at least four times daily, and the frequency will be increased during the peak of the escapement. Individual counts by species will be recorded using hand-held tally counters. Data should be recorded on the *Weekly Escapement Enumeration Form* (Figure 9). A standard escapement counting and sampling week will extend from Friday to Thursday (statistical week; Appendix E).

Escapement Sampling

As in previous years, sockeye salmon escapement age, length, and sex (ALS) sampling should be conducted at a rate of 240 fish per statistical week. In general, 80 samples will be collected every other day of the statistical week. Ideally, 80 samples will be collected each Sunday, Tuesday, and Thursday; statistical weeks begin each Friday. If it is obvious to the crew leader that following this strategy will result in failing to obtain the desired 240 sample size per week, adjustments should be made.

"Jack" salmon may behave differently than other age classes when they are migrating through the fish ladder. At times, the sample To counteract this apparent bias in sampling, obtaining samples during different times of the day or after different periods of time have elapsed since opening the gate is recommended. However, randomizing the sample is important so that the sample is not biased towards "non-jacks". Recording the number of "jacks" versus the number of "non-jacks" is important as these segregated counts will allow for the partial validation of this change in sampling design.

Stream and Lake Escapement Surveys

The primary objectives of lake and stream surveys are to document distribution and abundance of sockeye salmon within stream and lake shoal areas. Conduct surveys on spawning shoals of Linda and Midway Creeks at a minimum and other streams as time allows from 15 July through

21 August (Appendix F). Streams should be surveyed to the upper limits of spawner distribution, and the number of live and dead fish recorded (Figure 10). Stream mouth counts will be recorded separate from actual stream counts. Observers will survey on foot and count live and dead sockeye salmon using polarized glasses and tally counters. Before conducting surveys, tally counters will be inspected for proper functioning. While conducting these surveys it has been found that using one person to count and the other as a guard against bears has been the approach that works best.

Zooplankton Sampling

Zooplankton will be sampled in Frazer Lake once per month (15^{th} of each month) starting mid-May. Sampling supplies will be provided by staff from the Near Island Limnology Laboratory. Sampling locations are located at the southeast and northwest ends of the lake and will be marked with buoys (Figure 1). A vertical tow using a 0.2-m diameter, 153 micron mesh conical net will be used to collect a zooplankton sample at each limnology station. Before the tow is started, measure the station depth by lowering a weighted, metered line to the lake bottom. Check to make sure the collection basin and townet are clean of old tow sample contents or debris by rinsing with filtered water (cleaning will be done in town before departure). Lower the townet down at a steady rate, so that the cod-end stays below the opening of the net, until the bottom of the net is ~1 meter from the lake bottom. Retrieve the net manually at a constant rate of ~0.5 m/sec., stopping when the rim of the net is just above the surface, slowly working the contents of the tow towards the collection basin. Wash the net down with filtered water from the squirt bottle, remove the collection basin from the net and pour the contents into a 125 ml poly bottle containing 12.5 ml (10% of volume) of buffered formalin. Rinse the remaining tow contents off the collection basin screen using the squirt bottle containing filtered water. Continue rinsing the collection basin, and pouring the sample contents into a poly bottle until full. Cap the bottle and invert the bottle a couple of times to mix the sample and the formalin. Make sure the bottle is labeled with lake, station, date, depth, and the lid sealed with electrical tape to prevent contents from leaking out.

CREW LEADER RESPONSIBILITIES

The crew leader is responsible for making sure that the crew read and understand the Department's **field safety policy** and sign **the EMPLOYEE SAFETY SOP VERIFICATION.** The crew leader should also make sure that these documents are secured by the project leader prior to departing for the field. The crew leader is also responsible for the accuracy, completeness, and neatness of the collected data. In addition, the crew leader will be required to enter smolt data into MS Excel spreadsheets, construct preliminary smolt outmigration estimates, and complete a season summary report.

Season Summary Report

The crew leader is responsible for writing a season summary report. This report may be written in the field; however, the report is usually written back in town. The summary report will be a brief synopsis of the field season and include the following: (1) a chronology of sampling events and data collection, (2) problems incurred during the season including sampling and field camp operations, (3) suggestions for improvements/modifications to the enumeration and sampling programs, (4) equipment/building supplies for the following field season, and (5) an accurate log of fuel and bottled oxygen consumption. In addition, the crew leader is responsible for writing performance evaluations for the field crew. The evaluation should be discussed with the project leader prior to discussing it with the technician.

Daily Radio Schedule

Daily and cumulative smolt catch, dye test information, and current trap efficiency will be reported daily at approximately 1300 hours on SSB frequency 3.230 MHz Monday through Friday and 2000 hours on Saturdays and Sundays. This information will be recorded on the *Daily Smolt Radio Schedule Reporting Form* (Figure 11) and carefully edited prior to radio schedule. This same schedule will be used to report adult fish passage through the fish ladder. An additional radio check will be scheduled at 0800 hours for management; this schedule will not be implemented until June. Management has a second radio schedule at 2000 hours. This evening schedule is optional for the Frazer Lake camp. Radio schedules are very important and should be taken seriously. Failure to make radio schedule for two consecutive meetings will result in a flight to the camp to ensure the safety of the crew.

Air Charters

All air charters will be set up through Kodiak staff. Appropriate information regarding charters will be relayed through daily radio contact. It is important to properly label and contact office personnel when any data, equipment, or other freight is "back hauled" to Kodiak.

Time Sheets and Leave

During the field season, crewmembers are responsible for keeping track of their working time. Time sheets will be provided and a template with the appropriate codes will be sent out for review. Recorded time on the time sheets will be 'actual hours' spent on the job. Obviously, there is a finite budget and a list of priorities. Tasks will be completed in their order of importance without accruing too much overtime. Generally, most projects can be finished within normal working hours; however, there will be occasions when the normal working day (i.e., 7.5 hours) is insufficient to complete the necessary tasks. When these situations occur the crew will work longer and record the overtime. If unusual circumstances arise that necessitate extensive overtime, the project leader should be notified immediately.

During the field season, crewmembers will have days off (not necessarily the weekend). The crew leader will decide when the crew will have normal working days off. During these normal working days off, crewmembers should realize that they are still ADF&G employees and their actions reflect on the department. Extended leave is not allowed during the field season; flights in and out of camps are too expensive and field staff is limited.

Data Management

Crew leaders will be responsible for recording all of the job activities and compiling biological data. Pencil rather than a pen will be used for data entry. Data forms and a field log will be completed daily. "Rite in the rain" logbooks will be used while collecting data and data will be transferred to data forms after returning to the cabin. Use a number 2 pencil when filling in the AWL forms. Data will be reported to Kodiak staff via SSB radio. Completed data forms will be sent to Kodiak as scheduled flights permit. Data that is sent to Kodiak will be properly packaged and labeled.

A report of project activities will be sent to town weekly, or on the soonest available plane. A one page weekly report is sufficient.

Purchasing

During the field season, field crews will require additional items (e.g., groceries, fuel, or tools). Small lists may be read over the radio during the scheduled radio meeting; however, these lists should be limited to just a few items. Remember that radio time is limited and there are a number of other camps region-wide that are using the same frequency. Longer lists of materials should be sent to town on supply flights. Blank grocery lists will be sent to the field and the crew leader should remember to send orders in advance to ensure the correct grocery order for the next supply flight. It should also be remembered that the Frazer Lake budget allocates $20/day/person and this allocation will not be exceeded. Crew leaders should track grocery expenses and limit the number of requested specialty items. Similarly, planning should be made for fuel. Fuel is a necessity for many camp operations including heating the facility. However, past camps have left stoves on during the day while the crew was working outside unnecessarily burning fuel. These situations should be minimized.. Fuel is a necessity for many camp operations including heating the facility. However, past camps have left stoves on during the day while the crew was working outside unnecessarily burning fuel. These situations should be minimized.

Camp Inventory and Close Up

Inventory the Frazer Lake camp for all gear prior to leaving. Winterizing the cabin should include (but is not limited to): covering windows, covering and insulating propane connections, closing and locking all doors, winterizing the tractor (disconnecting battery), and bringing the boat in along with the mooring line.

Photo Documentation

The crew leader will be responsible for photo documenting project activities. It is important to photograph specific aspects such as trap installation, dye site, smolt sampling, adult sampling, fish pass operation, structural problems and remedies to the fish pass, and other detailed tasks. When possible ADF&G cameras and film will be used. If, however, ADF&G cameras are not available, film will be provided for use with personal cameras; in this case, the use of personal cameras is suggested, but not required. The department will pay for processing the film.

Visitors / Public Interaction

Frazer Lake gets many visitors, from day-use fishing and bear viewing to extended use through the refuge cabins or campers. Most of these visitors come by the camp because the falls and the weir attract bears for good bear viewing. Visitors also like to see the fish exiting the fish pass. Because of this contact, try to keep the camp clean and be courteous and helpful to visitors, but also inform them of boundaries. Be helpful when you can, but remember your primary role is to run the smolt and adult sockeye salmon research project.

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Table 1. Season summary of events.

Target Date	Event	Frequency
5/6-5/7 (2 days)	Open camp	
5/8- 5/10 (3 days)	Install smolt trap and lower diversion weir as soon as practicable.	
5/8-5/10 (3 days)	Assemble and organize work platform, work lights, and dye release station.	
5/6-8/24	Camp and equipment maintenance	as needed
5/2-6/15	Fish pass maintenance	as needed
5/6-~7/1	Sockeye smolt enumeration as necessary	Daily; sample 70/day 5 days/week; mark-recapture 1,000/week (if available).
5/15-8/15	Zooplankton sampling	Once per month
~6/15-8/25	Adult sockeye enumeration	Daily, ALS sample: 80/day 3 day/week (240 total/week).
7/15-8/25	Foot surveys	Linda and Midway Creeks (once a week).
~8/25	Close camp	

Table 2. Important tasks to remember.

1. Data on forms should be complete. Be familiar with the forms and when and how to collect the data. All crew should be familiar with the proper data collection methods.

2. Data should be collected as consistently as possible. For example, water temperature data should be collected at the same time and location each day.

3. Remember to record use of all expendables because this is a necessary item for future planning, and it is also a requirement for the crew leader summary report.

4. Remember to make scale drawings of the smolt trap, and photo document as many aspects of field and data collection as possible.

5. A daily crew log is a valuable way to record observations that may not be apparent from the data sheets.

6. Be familiar with the operational plan. The procedures used at Frazer Lake have many details, and it is important to be familiar with them.

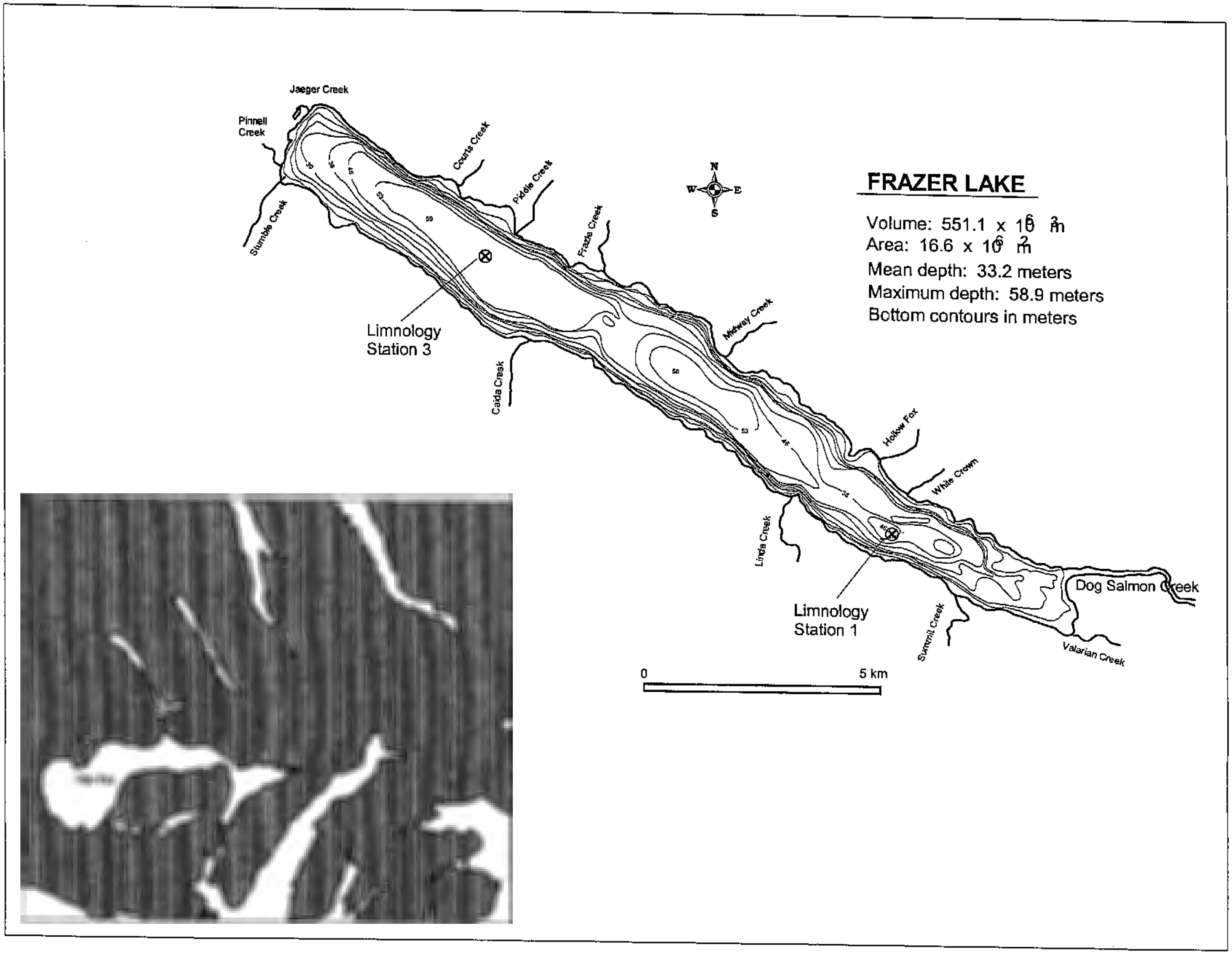


Figure 1. Map of Frazer Lake depicting inlet streams and the limnology stations.

DAILY SMOLT CATCH REPORTING FORM

TRAP NUMBER ______________________ PROJECT LOCATION ______________________ DATE ____________

TIME MILITARY	SOCKEYE SMOLT (NUMBERS)			OTHER (NUMBERS)			COMMENTS[2]
	CATCH[1]	EXAMINED FOR MARKS	MARKED RECOVERIES	COHO	DOLLY V.	STICKLEB.	
TOTAL							

[1] Catch number does not include marked recoveries.
[2] To be included in comments: estimate young-of-year fry numbers by species and number of sockeye smolt mortalities.

Figure 2. Daily smolt catch reporting form.

CATCH-WEIGHT SAMPLING FORM

Date: ______________ Time: _____to_____ Project Location ______________________
Basket weight (wet): ______________________

Basket #	Weight (fish+ basket)	Basket #	Weight (fish + basket)	Basket #	Weight (fish+ basket)	Basket #	Weight (fish+ basket)
1		11		21		31	
2		12		22		32	
3		13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	
TOTAL:		TOTAL:		TOTAL:		TOTAL:	

GRAND TOTAL ______________ LESS BASKET WEIGHTS ______________ = ______________ (a)

Sample Biomass (Fish plus basket weight)	CATCH	
	Sockeye Smolt	Other
1		
2		
3		
4		
TOTAL:	(c)	(d)

GRAND TOTAL ______________ LESS BASKET WEIGHTS ______________ = ______________ (b)

ESTIMATED CATCH: SMOLT (ac/b): OTHER(ad/b) ______________.

Figure 3. Catch-weight sampling form.

SOCKEYE SALMON SMOLT SUMMARY FORM

PROJECT LOCATION: ______________________

TRAP
NUMBER: ______________________

DATE[1]	NUMBER OF SMOLT					
	CAUGHT[2]					MARKED[3]
	DAILY	CUMMULATIVE	MORTALITIES	DYED	EXAMINED	RECOVERIES

[1] Each date covers a 24-hour period extending from noon to noon and identifies the starting date.
[2] Numbers of fish caught does not include marked recoveries.
[3] Marked recoveries are not included in the catch because they represent previously caught smolt.

Figure 4. Sockeye salmon smolt summary form.

SMOLT DYE RELEASE FORM

DATE (actual): ______________________

CREW
NAMES (Print) ______________________

PROJECT LOCATION: ______________________

NUMBER OF FISH
COLLECTED: ______________________
(from live box)

	COLLECTION LIVE BOX	TRANSPORT BUCKET	RECOVERY CONTAINER	DYE TUB	RECOVERY CONTAINER	TRANSPORT BUCKET	STREAM RELEASE
START TIME (military)							
START TEMP (degree celsius)							
END MORTALITY (number of fish)							
OXYGEN SUPPLEMENT O_2 or aerator(A)							

DYE SOLUTION (mixture): ____________ DYE (grams); ____________ WATER (gallons)

RELEASE SITE LOCATION (distance upstream of trap site, in miles) ______________________

TOTAL NUMBER OF DYED FISH RELEASED: ______________________

COMMENTS:

Figure 5. Smolt dye release form.

CLIMATOLOGICAL OBSERVATIONS

Project Location: ____________________

		TEMPERATURE		CLOUD	WIND		STREAM GAUGE[1]	
DATE	TIME	AIR (^{o}C)	WATER (^{o}C)	COVER (%)	DIRECTION	VEL. (MPH)	(cm)	COMMENTS

[1] Round to nearest 1 cm.

Figure 6. Climate observation form.

ALASKA DEPARTMENT OF FISH AND GAME

WEEKLY SALMON WEIR COUNT REPORT FOR YEAR:

WEIR CAMP______________________

PERSONNEL:_____________________

PAGE:______ OF ______

WEEKLY REPORT FOR WEEK ENDING (SATURDAY) ______________________

DATE																		
SUN		DAILY TOTAL ESCAPEMENT						REDS	JACK	JACK	GILLNET	INJURED	H_2O LEVEL		H_2O	WEATHER		
		REDS	KINGS	PINKS	COHOS	CHUMS	DOLLY V.	SAMPLED	NO.	%	REDS	REDS	UP	DOWN	TEMP	CEIL.	VIS.	WIND DIR/SPD.
MON	D																	
	A																	
TUE	D																	
	A																	
WED	D																	
	A																	
THU	D																	
	A																	
FRI	D																	
	A																	
SAT	D																	
	A																	
WEEK TOTAL	D																	
	A																	
AWL WEEK													COMMENTS:					
AWL ACCUM													COMMENTS:					
ADDTITIONAL COMMENTS: BEAR AND PEOPLE PROBLEMS; SMOLT MIGRATION; WEIR PROBLEMS; CABIN REPAIR; NOTE AIRCRAFT TRAFFIC													COMMENTS:					

Figure 7. Weekly escapement enumeration form.

forms98.xls

SOCKEYE SALMON STREAM SURVEY LOG

STREAM NAME	Date	Observer	Mouth Survey Cond.	Mouth Survey Method	Live Count	Stream Survey Cond.	Stream Survey Method	Live Count	Dead Count	Total	Stream temp (C)	Remarks

Figure 8. Sockeye salmon stream survey log.

DAILY SMOLT RADIO SCHEDULE REPORTING FORM

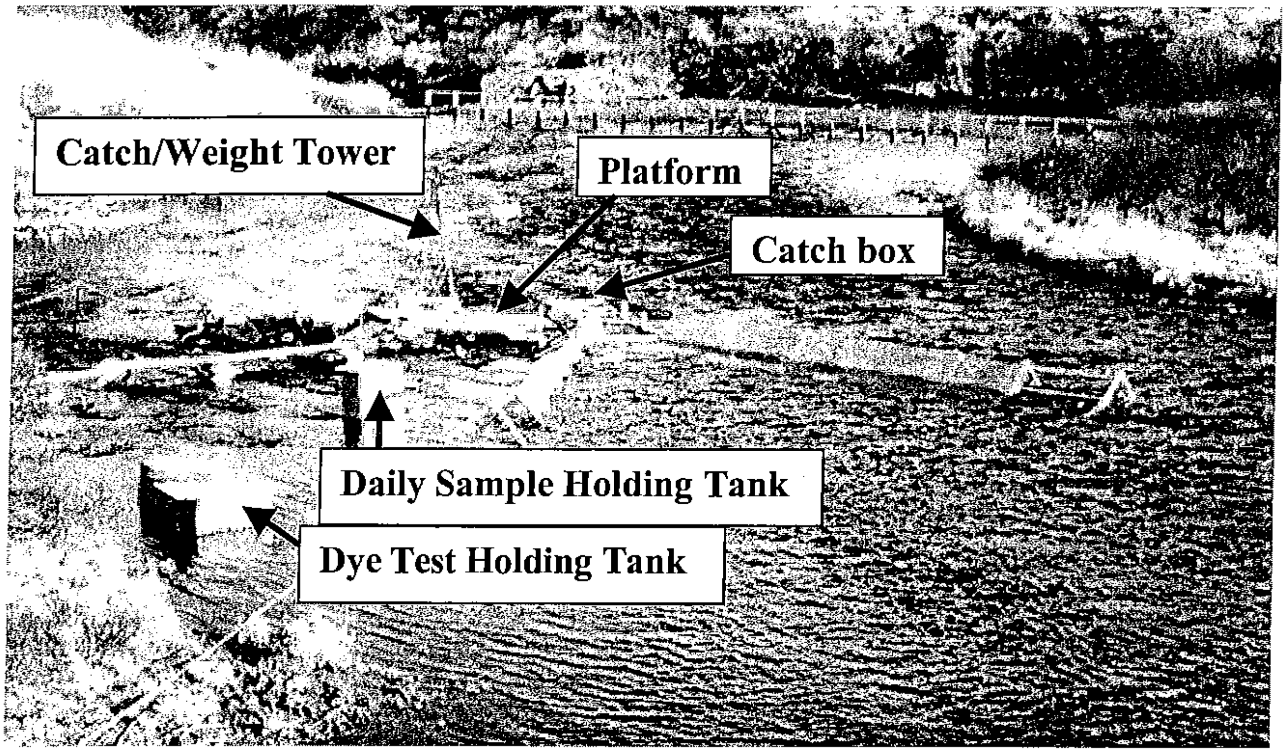
PROJECT: ______________________________

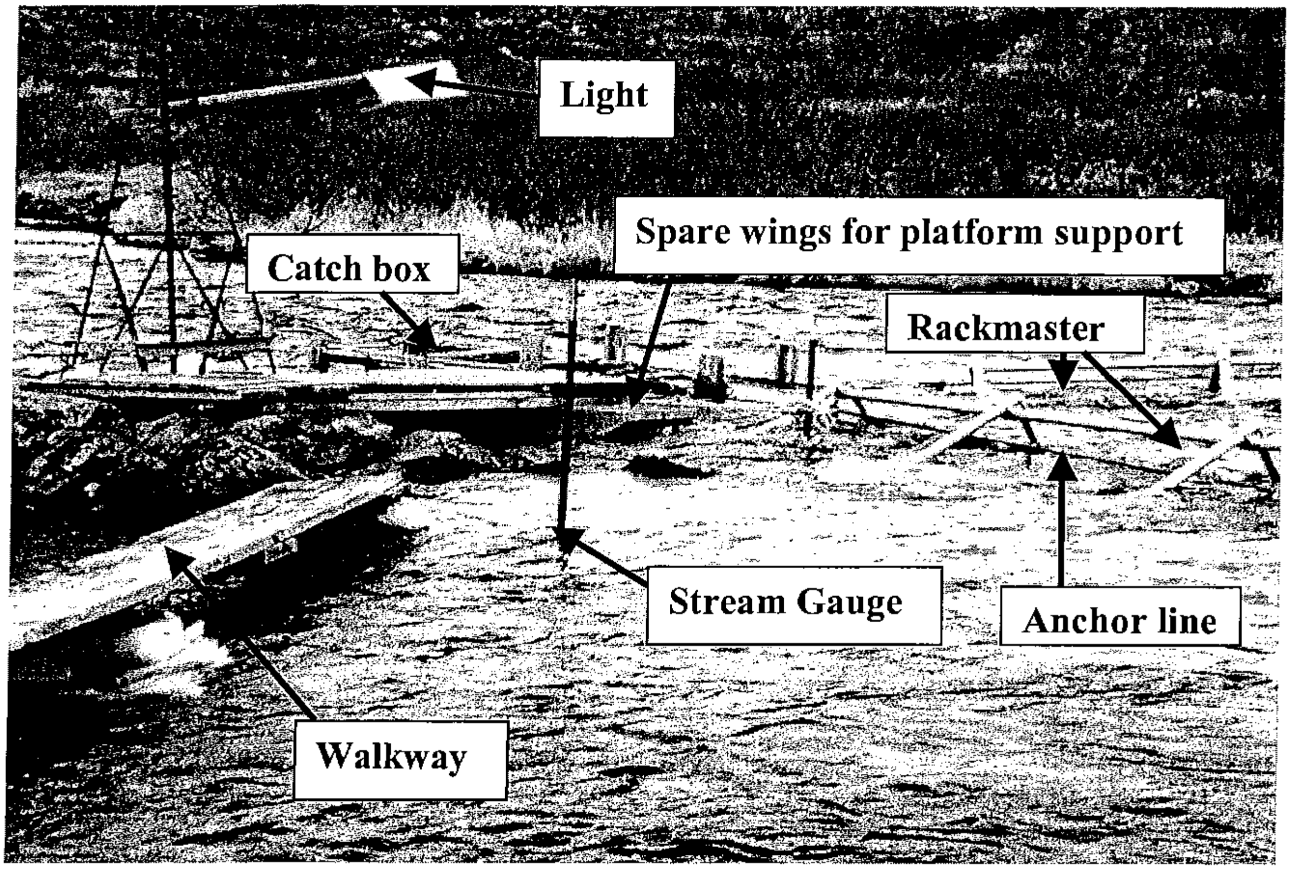
SMOLT DATE	INDEX TRAP SMOLT CATCH		DYE RELEASE	NUMBER RECAPTURES	CURRENT TRAP EFFICIENCY	COMMENTS: (INCLUDED # AWL SAMPLED)
	DAILY	CUMMULATIVE				

Figure 9. Radio schedule report form.

APPENDIX

Appendix A. Photos of the Frazer Lake smolt trap.





Key to Field Identification of Anadromous Juvenile Salmonids in the Pacific Northwest

By

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ABSTRACT

A key is presented with descriptive illustrations to help in field identification of live, juvenile salmonids in fresh waters of the Pacific Northwest. Other juvenile fish that may be mistakenly identified as salmonids are included.

INTRODUCTION

Species identification of live, anadromous juvenile salmonids is frequently a problem to the field biologist. The purpose of this key is to list and illustrate the external characteristics which will expedite field identification of juvenile salmonids in the Pacific Northwest.

Five species of Pacific salmon (pink, chum, sockeye, chinook, and coho); four species of trout (cutthroat, brown, Dolly Varden, and rainbow or steelhead); and other juvenile and adult fish [1] that may be mistaken for salmon or trout in fresh water are described in this key.

USE OF KEY

The characteristics for identification are listed in a series of alternative statements, some of which are illustrated. To use the key, examine the first statement; if applicable, proceed to the next and continue to successive statements until the species is identified. If a statement is not applicable, pass to the alternative characteristics indicated by numbers in parentheses (numbers on the drawings correspond to numbers of statements in the key). Continue in this manner until the specimen is identified. Some external characteristics are positive separating features (marked with asterisk), whereas others are not. Therefore, two or more statements should be considered before final rejection. If a precise identification cannot be made using the external characteristics —and the fish can be sacrificed, a positive identification can usually be made from internal features (marked with double asterisks). A bibliography of keys that utilize more descriptive internal characteristics is included in this paper.

[1] Especially adult smelt, family Osmeridae.

KEY

1. (47) Adipose fin and scales present. (Fig. 1)
2. (48) Fleshy appendage at base of pelvic fins present.
3. (49) Mouth large, reaching at least to center of eye.

Family Salmonidae

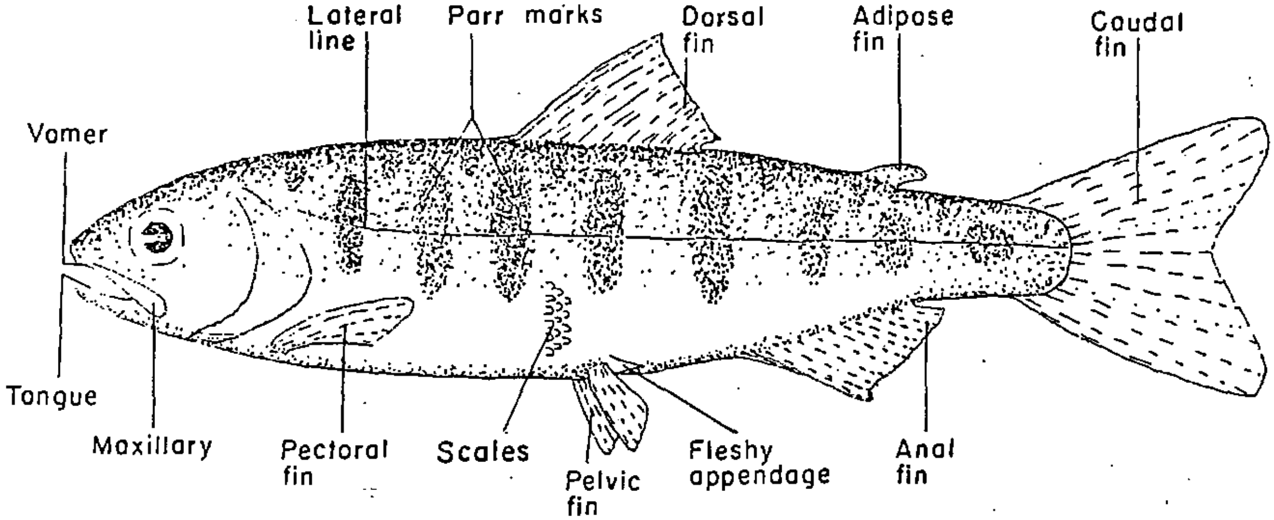


Figure 1.—A hypothetical salmonid showing external characteristics.

4. (17) Anal fin higher than long, with 8 to 12 developed rays (Fig. 2A)
5. (52) *Teeth on head and shaft of vomer. (Fig. 3A)

19

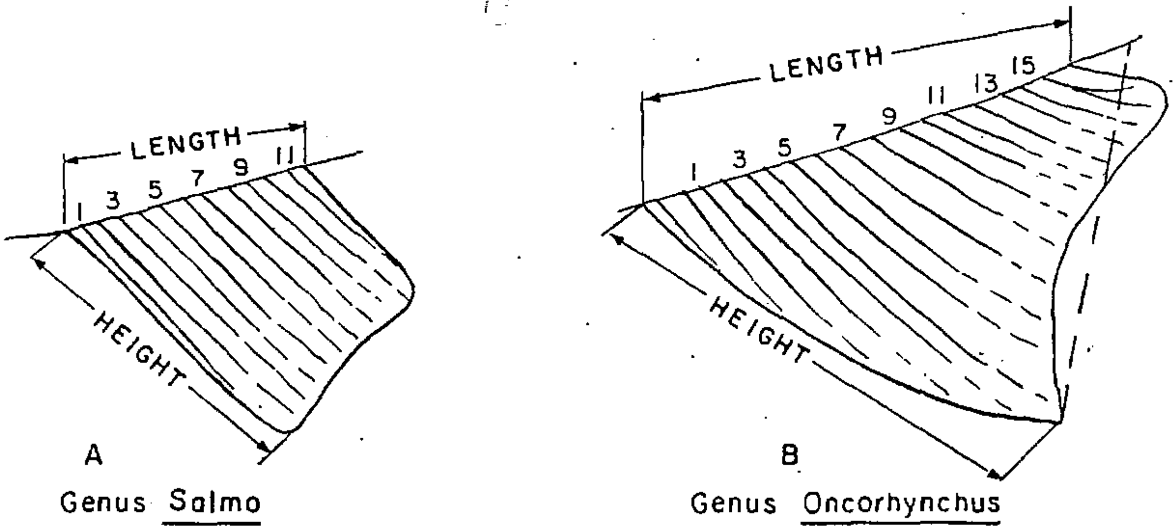


Figure 2.—Anal fins: (A) Trout, genus *Salmo;* (B) Pacific salmon, genus *Oncorhynchus.* The two drawings show differences in structure and fin ray count. (Note that the length of the anal fin is its overall basal length, and its height is that distance from the origin of the fin to the tip of the anterior lobe. In counting fin rays, include only those which originate from the base and terminate at the outer margin of the fin or are half as long as [or greater than] the longest ray.)

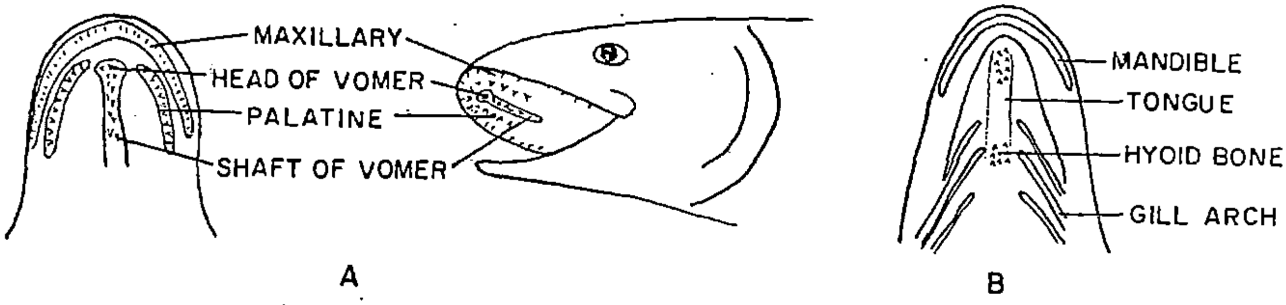
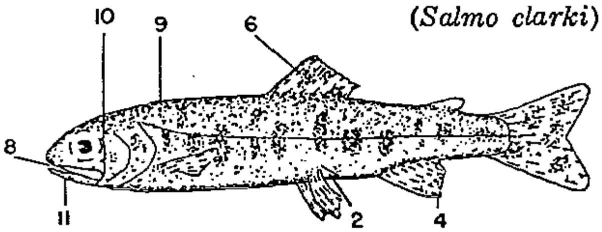


Figure 3.—Location of dentition in (A) the roof and (B) the floor of the mouth of salmonid fishes. (Presence or absence of teeth on the vomer or tongue may be determined by use of the little finger or a blunt instrument. The small hyoid teeth at the base of the tongue are located between the gill arches of the lower jaw and are difficult to find.)

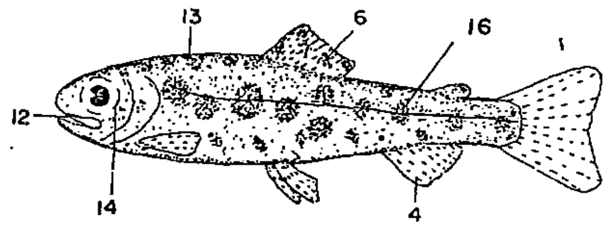
6. (18) Dorsal fin with large dark spots.
Trout
Genus *Salmo*

7. (53) Adipose fin not orange; no row of pale round spots along lateral line.
8. (12) *Small hyoid teeth at base of tongue. (Fig. 3B)
9. (13) Not more than five parr marks on mid-dorsal ahead of dorsal fin.
10. (14) Maxillary reaching past posterior margin of eye.
11. (15) Red or yellowish hyoid mark under lower jaw. Tail usually black spotted.
Cutthroat trout
(*Salmo clarki*)



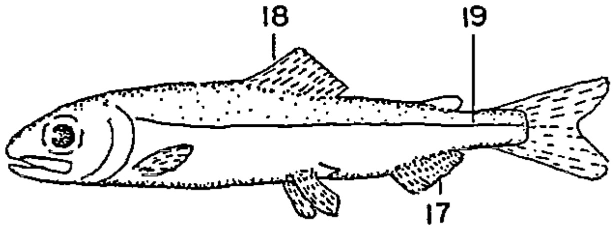
12. (8) *No teeth at base of tongue.
13. (9) Five to 10 parr marks along mid-dorsal ridge ahead of dorsal fin.
14. (10) Maxillary short, not reaching past posterior margin of eye.
15. (11) No hyoid mark under lower jaw. Few or no spots on tail.

16. (20) Parr marks almost round.
Rainbow or steelhead trout
(*Salmo gairdneri*)



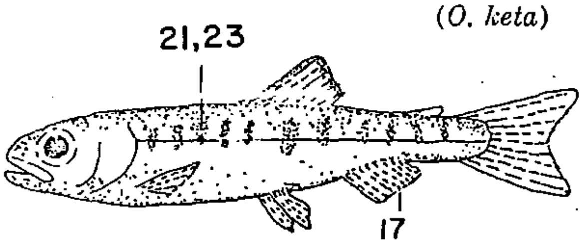
17. (4) Anal fin longer than high, with 13 or more developed rays. (Fig. 2B)
18. (6) Dorsal fin without large dark spots, may be black tipped.
Pacific salmon
Genus *Oncorhynchus*

19. (20) No parr marks. Fry leave fresh water while small—approximately 1.75 inches (45 mm) long.
Pink salmon
(*O. gorbuscha*)



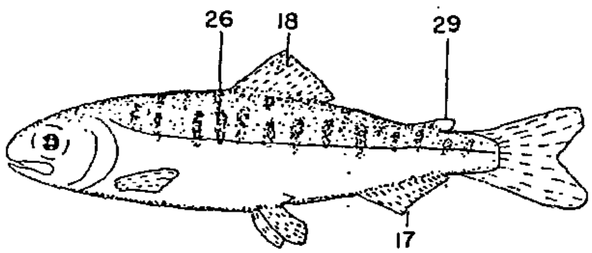
20. (16) Parr marks present as vertical bars or oval spots.
21. (30) Parr marks short, extending little, if any, below lateral line.
22. (25) Gill rakers on first arch, 19 to 26. ** Pyloric caeca, 140 to 186.
23. (26) Parr marks faint. Sides below lateral line iridescent green.
24. (27) Small when migrating from fresh water, approximately 1.5 inches (40 mm) long.

Chum salmon
(*O. keta*)



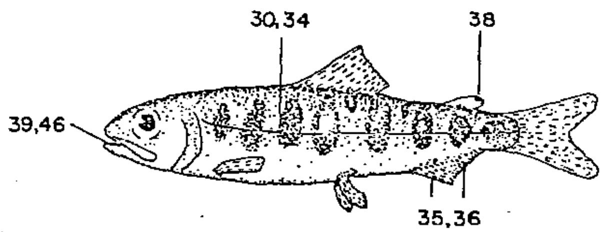
25. (22) Gill rakers on first arch, 30 to 40. **Pyloric caeca 60 to 115.
26. (23) Parr marks usually sharply defined. Sides below lateral line silvery, not iridescent green.
27. (24) Relatively large when migrating from fresh water, approximately 3 to 5 inches (80 to 126 mm) long.
28. (31) Gill rakers long and slender, more than 29 on first arch.
29. (32) Adipose fin clear, not pigmented.

Sockeye salmon
(*O. nerka*)



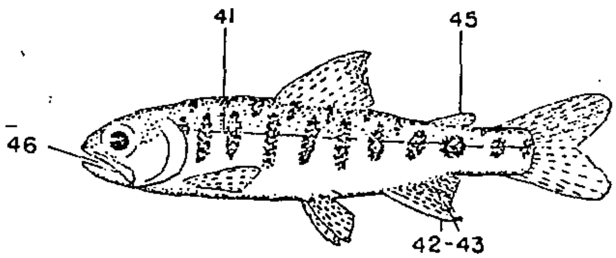
30. (21) Parr marks large, vertical bars centered by lateral line.
31. (28) **Gill rakers short and thick, fewer than 29 on first arch.
32. (29) Adipose fin at least partially pigmented.
33. (40) **Plyloric caeca more than 90.
34. (41) Parr marks broader than interspaces.
35. (42) Anterior rays of anal fin not distinctly longer than rest, not white edged.
36. (43) Anal fin not pigmented.
37. (44) Black spots, when present, on both lobes of caudal fin.
38. (45) Adipose fin not completely mottled, clear area at anterior base of fin.
39. (46) Black gums along base of lower teeth.

Chinook salmon
(*O. tshawytscha*)



40. (33) **Plyloric caeca less than 80.
41. (34) Parr marks narrower than interspaces.
42. (35) Anterior rays of anal fin elongated; when depressed they extend to base of last ray. (Fig. 2B)
43. (36) Anal fin pigmented between rays, resulting in black banding.
44. (37) Black spots, when present, on upper lobe of caudal.
45. (38) Adipose fin completely pigmented.
46. (36) Mouth gray to white.

Coho salmon
(*O. kisutch*)



47. (1) Adipose fin not present; scales present or lacking.
Not Salmonidae

48. (2) No fleshy appendage at base of pelvic fins.
Smelts
Family Osmeridae

49. (3) Mouth small, not reaching center of eye; teeth weak or absent.

50. (51) Depressed dorsal fin, shorter than head.
Whitefishes
Genus *Coregonus*

51. (50) Depressed dorsal fin, longer than head.
Arctic grayling
(*Thymallus arcticus*)

52. (5) **Teeth on head of vomer only.
Chars
Genus *Salvelinus*
Dolly Varden (*S. malma*)

53. (7) Adipose fin orange; row of distinct pale round spots along lateral line.
Brown trout
(*Salmo trutta*)

ACKNOWLEDGMENTS

We especially thank Dr. Arthur D. Welander, Professor of Fisheries, and Dr. Bruce S. Miller, Research Biologist, College of Fisheries, University of Washington, Seattle, for their valuable suggestions. We also thank Galen H. Maxfield, Fishery Biologist, and Dr. Alan J. Beardsley, Fishery Biologist, both from the NMFS Northwest Fisheries Center, Seattle.

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1967. The fresh-water fishes of British Columbia. B. C. Prov. Mus., Dep. Recreation Conserv., Handb. 5. 192 p.

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1946. Fishes of the Pacific Coast of Canada. Fish. Res. Board Can., Bull. 68. 368 p.

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1935. The identification of the young of the five species of Pacific salmon, with notes on the fresh-water phase of their life-history. B. C., Rep. Comm. Fish. 1934: K106-K116.

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1957. Fish guide for intermountain Montana. Mont. State Univ. Press, Missoula. 88 p.

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1961. Keys to Oregon fresh-water fishes. Oreg. State Univ., Agric. Exp. Stn., Tech. Bull. 58. 42 p.

Pacific Northwest

BURGNER, R. L. (edited by William A. Smoker).
1955. Preliminary key for identification of salmon fry, juveniles, and adults. State of Wash., Dep. Fish. 8 p. (Processed.)

Appendix C.1. Procedures for sampling salmon smolt for age, weight, and length.

The sample size is 70 sockeye salmon smolt per day, five days a week. If daily sampling objectives are being met, sampling will not occur on Wednesday and Sunday. When possible, smolt collected for sampling should be taken throughout the night rather than at a single time interval. It is essential that the sample be taken randomly. In the event that more than the required sample size is in the smolt trap at the time of sampling, the trap should be stirred to assure randomness. When the smolt are randomly distributed, a small dip net should be used to remove a subsample. This procedure should be repeated until the sample size goal is met.

AWL Forms

Note that AWL forms have changed since the 1999 season. Any data recorded on the old forms will be returned to the crew leader for transcription on the new forms. However, the instructions for recording data on the new forms are identical to the old. Smolt length and weight will be recorded on AWL forms (Appendix C.2). Using a No. 2 pencil, complete each section of the left side of the AWL and darken the corresponding blocks:

Description: Include species (sockeye smolt), location, year, and sampler's names.

Card: Thc AWL forms and corresponding slides are numbered sequentially by datc throughout the season starting with # 001. A new, consecutively numbered, card is used each day even if the previous card is not completed. There may be a minimum of one fish and a maximum of 40 fish (8 slides) per AWL.

Species: Refer to the reverse side of the AWL form to obtain species; sockeye = 2.

Day, Month, Year: Use the appropriate digits for the date the fish are sampled.

District, Subdistrict, Stream, Location:

	District	Subdistrict	Stream
Frazer	257	40	403

Period: List the period in which the fish were sampled using Appendix E.3.

Project: Refer to the reverse side of the AWL form to obtain a code; **code 8** will be used for smolt.

Gear: Refer to the reverse side of the AWL form to obtain code; 00 = trap.

Mesh: Leave blank.

-Continued-

Type of Length Measurement: Refer to the reverse side of the AWL form to obtain code;
1 = Tip-of-snout to fork-of-tail; see appendix C.3.

Number of Scales: Mark 1 (refers to 1 smear/fish)

# of Cards: Mark 1 (each AWL form is individually numbered)
Keep the litho codes in numerical order throughout the season and **be sure to transfer the litho code from the front left side to the backside of the AWL form.** These forms will be optically scanned into a computer and stray marks may be misinterpreted. It is the crew leaders responsibility to make sure that all forms are carefully edited before returning them to your supervisor.

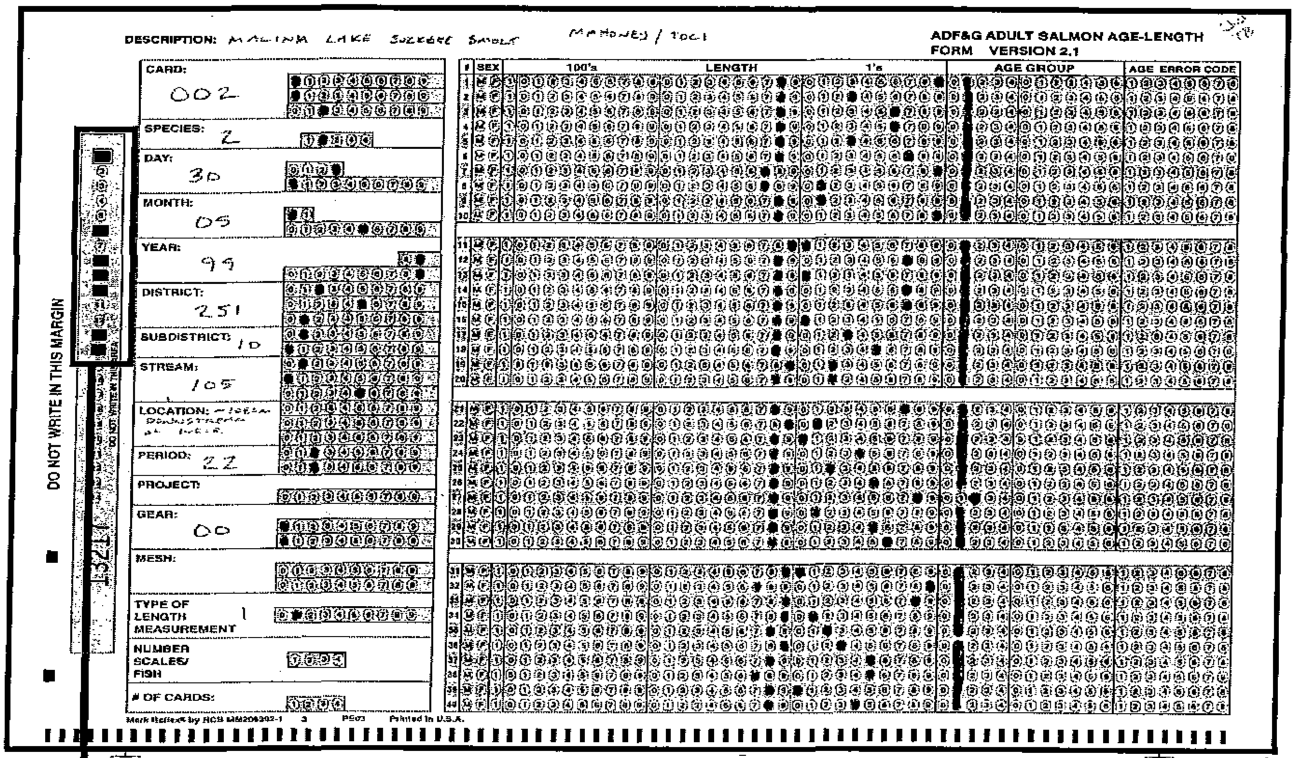
Sampling procedure

Smolt should be kept alive and sampled the day of capture. MS222 will be used to anesthetize the fish. A flattened probe should be used to remove 5-10 scales from the preferred area, consult Appendix C.4. The scales should be mounted on a glass slides. Be sure to **wipe the probe off after mounting the scales for each fish** to minimize mixing scales from the previous fish. Try to separate scales without overlap. The left portion of each slide should be labeled: location, date, AWL # (card #), and fish numbers (1-5, 6-10, 11-15, etc.). Labeling is demonstrated in Appendix C.5. When the slides are completed, return them to the box in order, and label the box. Make sure the label on the box is complete, so that they will not be confused with other project's data. Smolt lengths will be measured in millimeters from the tip of the snout to the fork of the tail. Record each length by darkening the appropriate column blocks on the AWL form.

Individual smolt weights should be recorded to the nearest 0.1 gram on the backside (right side) of the AWL form. Keep the container that contains the smolt on the scale wet and re-zero with the water.

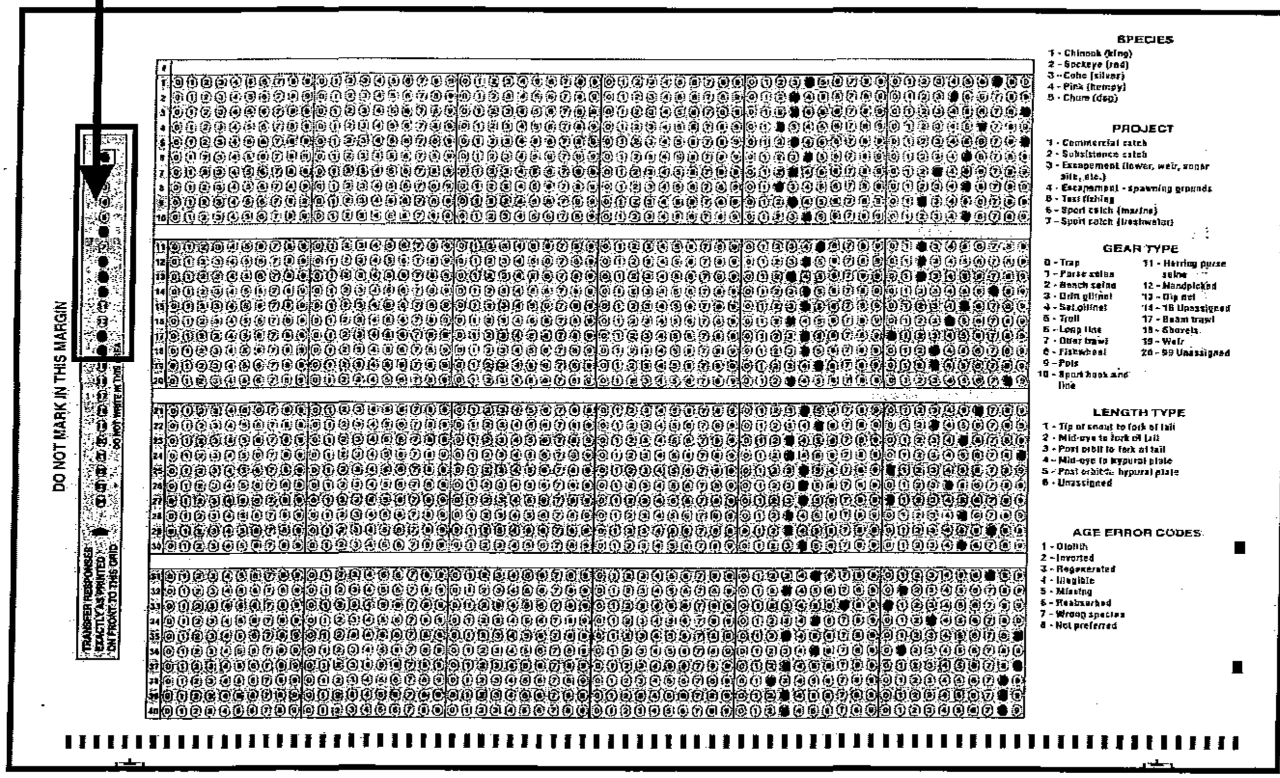
Take care to ensure length and weight data corresponds to the appropriate scale smear as this information is used to calculate condition factor at age. When sampling for age, length, and weight, rite-in-rain books may be used to record data. After sampling is done, transfer the data carefully to the AWL forms. Data should be transcribed to AWL forms daily to help prevent the introduction of error. **It is the responsibility of the crew leader to make sure the data has been transferred correctly and the AWL form is filled out completely. If forms are found to contain error during the opscanning process they will be returned to the crew leader for necessary editing.**

Appendix C.2. Example of a filled out AWL form for sampled smolt.

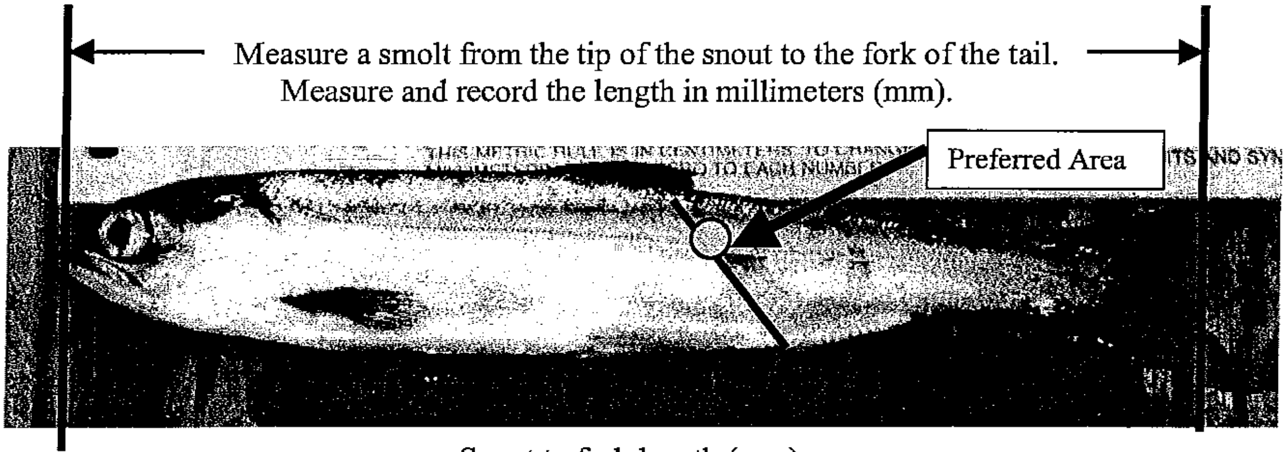


Fill in litho codes.

Backside of AWL



Appendix C.3. Scale sampling procedure showing the preferred area on a salmon smolt.

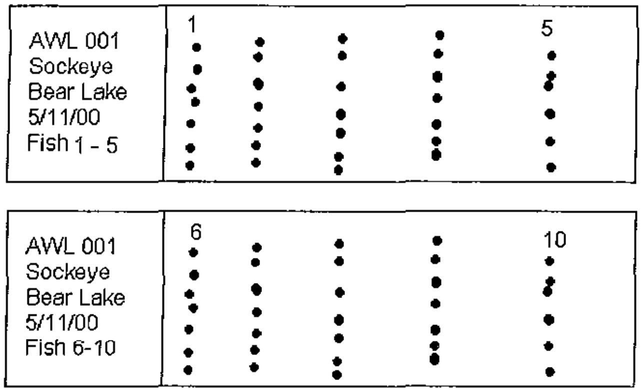


Snout to fork length (mm)

Appendix C.4. Salmon smolt slide example.

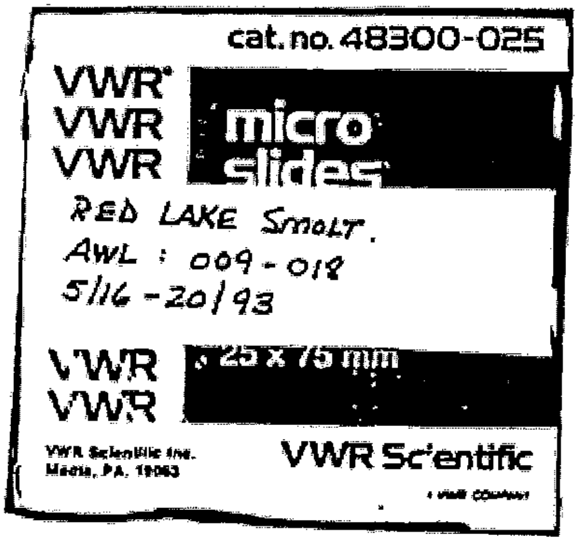
The following information should be legibly written on the slide label:

1. AWL #
2. Location
3. Date (mo/day/year)
4. Fish # (1-5, 6-10, etc.)



When the slides are completed, return them to the box in order by AWL# and fish #, and label the slide box top with the following information:

1. Location
2. AWL Numbers (e.g., AWL #009-018)
3. Beginning and ending dates (e.g., 5/16-5/20)



Appendix D. Fish pass maintenance and operation.

Initial maintenance of the fish pass should be completed prior to 1 June to ensure proper functioning of the facility.

Maintenance consists of the following:

1. Inspect the fish passes for structural damage.
2. Install the modified I-beam supports on the diversion weir above the falls.
3. Clean the debris from the fish pass tanks.
4. Clean the fish pass entrance and add rocks if necessary.
5. Clear rocks and streambed materials from the exit tank, channel, stop-log base of water control weir, and entrance tanks.
6. Pad the inside of tank lids with astroturf to reduce fish mortality while insuring that it is securely fastened.
7. Replace damaged plywood fishpass covers.

Fish pass opening procedures include:

1. Insert wood drain plugs from the inside of the tanks into drain holes. Plugs should fit tightly, so that internal tank water pressure holds the plug in place. Install the tank caps by screwing them on from the outside.
2. Position tank covers, and remove stop-logs slowly from exit tank. The **bottom stop-log remains in place**. Note that if stop-logs are removed rapidly gravel is deposited into tank.
3. Make sure no holes are present where fish could escape uncounted.

The fish pass should be operated so that the steep pass is about 3/4 full of water. This volume is necessary to attract sockeye salmon to the entrance tank and promote optimum fish passage. A water level of 1.8-1.9 feet should be maintained on the staff gauge by removing or placing stop-logs at the water control diversion (top of falls). At this level the old fish pass should be 3/4 full. Try to keep stop logs relatively even level across the weir to prevent excessive erosion.

A vertical slot "door" should be placed at the entrance tank during the sockeye salmon run. This door should be checked daily during fish passage to assure it is completely down. It can open, inadvertently, when sockeye salmon hit against it. The opening space (23 cm) is needed to maintain velocity for fish attraction. The door can be opened to 1 foot (30 cm) at seasons end to further attract fish.

The fish pass should be checked daily for cover tightness and unobstructed water flow. Under no circumstances should obstructive materials be placed in the exit tank or steep passes. Make sure to remove any dead fish observed in the exit tank as soon as possible because dead fish will accumulate in the resting tanks making the end of season task of cleaning extremely unpleasant.

Avoid allowing detergents or chemicals from entering the fish pass water supply.

Post a "keep off the fishpass sign" on the trail between the cabin and the fishpass and put up other signs directing visitor traffic to appropriate trails.

-Continued-

Fish pass closing procedures (approximately 25 August):

1. Remove stop-logs and I-beam supports from the water control weir. Stack logs on the stream bank and store the I-beams (well greased) in the tractor shed. Replace stop-logs in the exit tank, and visqueen as necessary to stop water flow between logs.

2. Remove all the drain caps by lightly tapping them from outside of the tanks, and store the plugs in the tractor shed. All water should be drained from the tanks. All residual materials within the tanks should be removed.

3. Remove the vertical slot door and replace it with a solid door to prevent unwanted animals from entering.

4. Inspect the fish pass and the facility for needed repairs, and list needed materials in the daily log/annual report. **Also include fuel caches and propane so that we know what is left behind.**

4. When the lower weir is removed, panels should be stored on the lower stream banks. Bolts on the weir should be tightened and replaced if necessary. Catwalk and stringer materials should be inspected and replaced if required. Add lumber needs to the materials list.

Appendix E.1. Procedure for sampling adult salmon for age, length, and sex.

Annually, salmon escapements and catches are sampled for age (scales), length, and sex (ALS) by field crews throughout the state. This database is essential for sound management of the State's salmon resources.

To be useful, data must be recorded on the mark-sense (AWL) forms neatly and accurately. Scale samples must be collected and mounted properly to ensure accurate age determination. The following procedures are to be adhered to when sampling for age, length, and sex.

COMPLETING THE AWL FORMS:

Note that AWL forms have changed since the 1999 season. Any data recorded on the old forms will be returned to the crew leader for transcription on the new forms. The new forms are green. The instructions for recording data on the new forms is identical to the old. A completed AWL form and accompanying gum card for sampling sockeye and chum salmon are shown in Appendix E.2.

Complete each section of the left side of the AWL form using a No. 2 pencil and darken the corresponding blocks as shown in the figures. Make every effort to darken the entire block because the optical scanner, which reads and records the data from the AWL forms, often misses partially filled blocks. Label only one form at a time to avoid marks from one form transferring to another.

Description :
Record the following: species/area/catch or escapement/gear type (seine, weir, etc.)/samplers

Card :
The AWL forms and corresponding gummed card(s) are numbered sequentially by date throughout the season starting with 001. A separate numbering sequence will be used for each species, district, and geographic location. Consult your port supervisor for the current card number. Sockeye scale samples will have only 1 gum card per AWL form as shown in Appendix E.2.

Species:
Use code 2.

Day, Month, Year:
Use appropriate digits for the <u>date the fish are caught.</u>

District :
Frazer = 257.

Subdistrict (Section):
Frazer = 40

Stream:
Frazer = 403

-Continued-

Location:
Frazer Lake= 038 (Appendix E.4).

Period:
List the period in which the fish were caught (Appendix E.3.).

Project and Gear:
The project code is 03 and the gear code is 00

Mesh :
Leave blank unless specifically instructed by supervisor to do otherwise.

Type of length measurement :
Use (2) mid-eye to fork-of-tail. Refer to Appendix E.5.

# of cards :
Mark 1 (each AWL form in individually numbered) when sampling sockeye salmon.

Keep the litho codes in numerical order throughout the season and keep the AWL forms flat, dry, and clean. Fish gurry and water curling will cause data to be misinterpreted by the optical scanning machine. **It is the crew leaders responsibility to make sure that all forms are carefully edited before returning them to your supervisor.**

GUMMED CARDS:

Fill out the gum cards as shown in Appendix E.2.

Species:
Write out completely (i.e., chinook, sockeye, etc.).

Locality:
Write Frazer Lake escapement.

Stat. code and Sampling date :
The stat code is 257-40-403 and the sampling date is identical to that used on the AWL

Gear :
Write weir/trap

Collector(s):
Record the last names of person(s) sampling.

Remarks :
Record any pertinent information such as number of scales per fish sampled, etc. Transfer this same information to the top margin of the AWL.

-Continued-

SAMPLING PROCEDURE:

A. GENERAL

1. Record information in 'write in rain' books and transfer to AWL forms when in a dry environment (i.e., back in the cabin)

2. Place the fish on its right side to sample the left side.

3. Determine sex of the fish and darken M or F in the sex columns. If any difficulty is encountered with this procedure, write "I had trouble sexing these fish" on the top margin of the AWL and ask your supervisor for help as soon as possible before sexing additional fish.

4. Measure fish length in millimeters from the mid-eye to fork-of-tail. Record length by blackening the appropriate column blocks on the AWL form. Column 3 on the AWL form is used for fish with a length greater than 999 millimeters (Chinook). Measure all species of salmon to the nearest mm.

5. Remove the "preferred scale" from the fish by grasping its exposed posterior edge with forceps and pulling free. Remove all slime, grit, and skin from the scale. The "preferred scale" is located on the left side of the fish, two rows above the lateral line on the diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin (Appendix E.6.). If the "preferred scale" is missing, select a scale within the preferred area on either the left or right side of the fish. If no scales are present in the "preferred area" on either side of the fish, sample a scale as close to the preferred area as possible.

6. It is important to take care that scales adhere to the card, rough side up. Therefore, without turning the forceps over, clean, moisten, and mount the scale on the gummed card with your thumb or forefinger. Exert just enough pressure to spread and smooth the scales directly over the number as shown in Appendix E.6. The ridges on the sculptured side can be felt with a fingernail or forceps. Mount scale with anterior end oriented toward top of gum card. All scales should be correctly oriented on the card in the same direction (Appendix E.7).

7. When sampling sockeye repeat steps 1 through 5 for up to 40 fish on each AWL form.

8. When sampling at weirs use write in rain books to record the data. Keep the mark-sense forms in camp where they will be clean, dry, and flat. After sampling is done for the day transfer the data to the mark-sense forms. **It is the responsibility of the crew leader to be sure the data has been transcribed correctly and the AWL forms filled out completely. It also important to: (a) double check all AWL data forms with a second and possibly third read-through so that any mistakes in transcription are corrected; and (b) IT IS THE CREW LEADERS RESPONSIBILITY TO MAKE SURE THAT ALL DATA IS VIRTUALLY ERROR FREE OTHERWISE YOUR TIME WILL BE SPENT DATA EDITING AT SEASONS END!!!**

-Continued-

SCALE SAMPLING CHECKLIST

OPERATIONAL PLAN	PENCILS (NO. 2)
GUM CARDS	FORCEPS
AWL FORMS	PLASTIC CARD HOLDERS
CALIPERS	CLIPBOARD

SOME REMINDERS

1. For greater efficiency in scale reading and digitizing, mount scales with anterior end toward top of scale card.

2. AWLs should be carefully edited. Re-check header information on AWLs; make sure all available information is filled in. Take extra care to use the correct period code for the sampling or catch date. AWL numbers should not be repeated; a frequent error is to begin a week's sample with the last AWL number used the week before. This is particularly important if the data is regularly sent to town; it is easy to forget which AWL numbers were used. Crew leaders should take time to ensure that the boxes are being blackened correctly, if the boxes are sloppily marked the optical scanner records the information incorrectly or misses it entirely. Keep pencil marks within each block, filling it completely.

3. Transfer important comments from scale cards to AWLs. After pressing scales, the cards are seldom referred to again, and important remarks can be lost. Write comments in the top right margin. If there is not room on the AWL to completely explain the remarks, use a separate piece of paper.

4. Never put data from different dates on one AWL or one scale card. Even if only one scale is collected that day, begin a new AWL and gum card the next day.

5. If weights are taken, they may be noted in the right margin of the AWL during sampling, but be sure to transfer the weights and litho code to the appropriate columns on the reverse of the AWL before submitting it to your supervisor.

6. The data processing program uses the "litho code" on the AWL; it is located in the lower left margin of the AWL. Try to keep the litho codes in numerical order. This should not be hard to do if they are arranged that way before page numbering. Those who sample different areas throughout the season can arrange the litho codes in order before each sample is taken.

7. If AWLs get wrinkled or splotched they should be transcribed onto a new AWL prior to sending in. The optical scanning computer will misread or reject wrinkled sheets. Do not use paper clips on AWL forms.

-Continued-

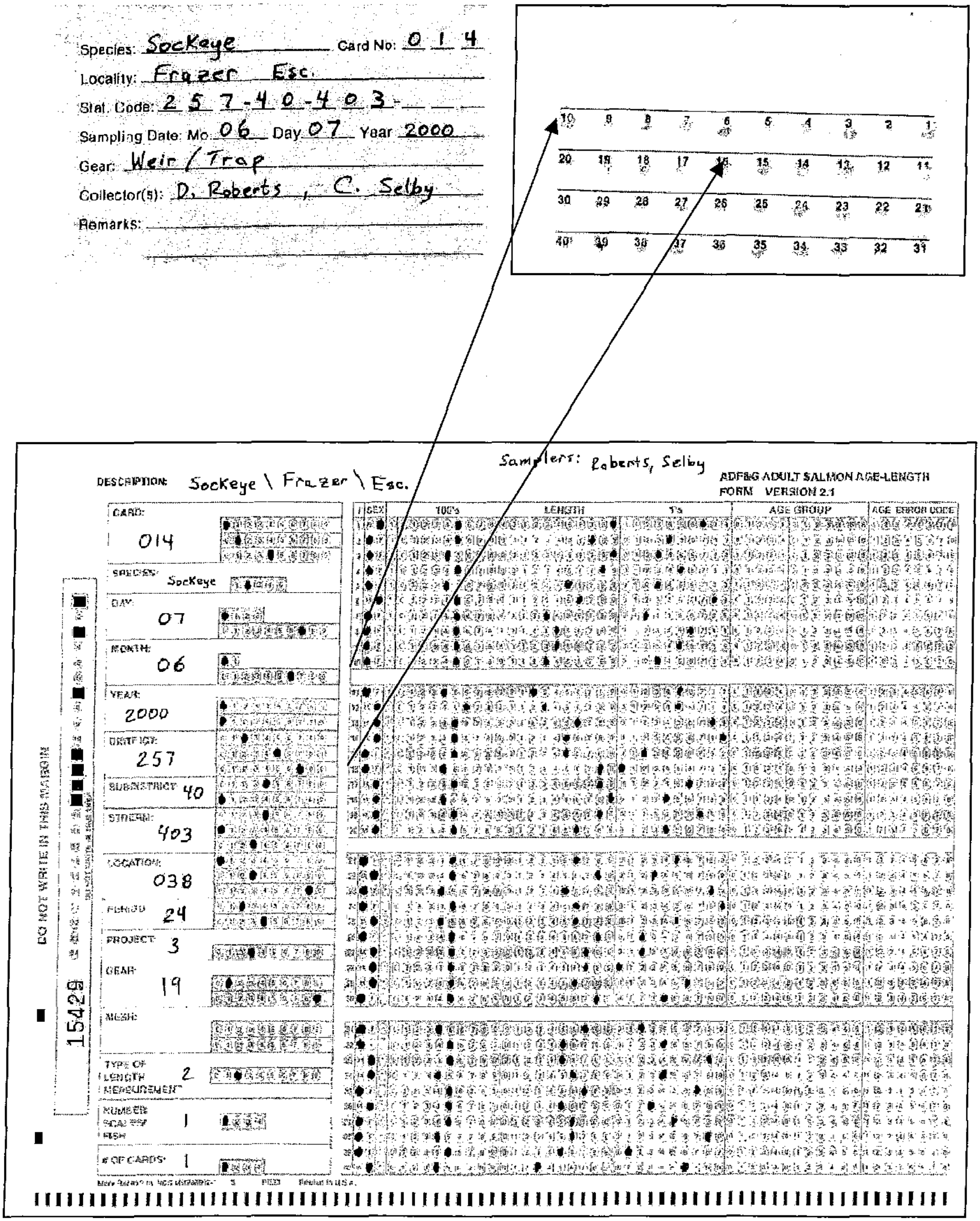
8. Be careful when collecting and mounting scales in wet conditions (rain, high humidity, etc.) Glue often obscures scale features and scales frequently adhere poorly to wet card. Protect the cards, keep them dry to avoid having to remount the scales on a new card.

9. Scan the AWL form for mistakes. A common error occurs, for example, in placing both the 4 and 7 of a 475 mm fish in the 100's column with nothing in the 10's column.

10. Record all comments explicitly on the gum card under remarks and transfer remarks to the top margin of the AWL form.

11. Responsibility for accuracy lies first with the primary data collector(s). The project supervisor will return sloppy or incomplete data to individual collectors for correction.

Appendix E.2. Completed AWL (front side) and individual scale "gum" card from Frazer fish pass.



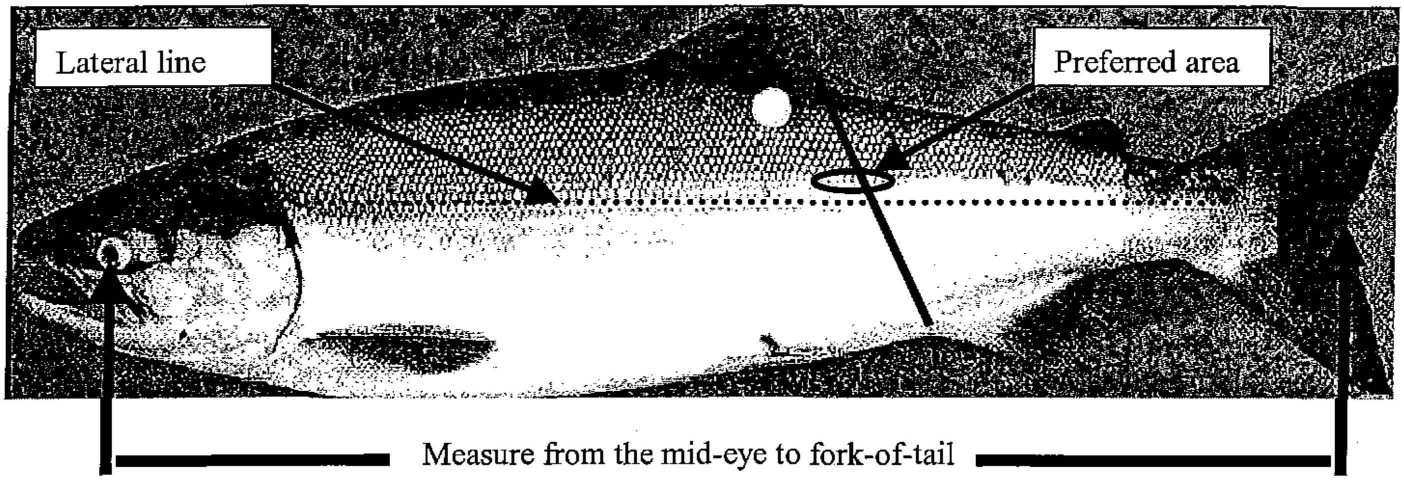
Appendix E.3. Statistical week (period) calendar.

Week	Calendar Dates	Week	Calendar Dates
1	01-Jan to 03-Jan	28	05-Jul to 11-Jul
2	04-Jan to 10-Jan	29	12-Jul to 18-Jul
3	11-Jan to 17-Jan	30	19-Jul to 25-Jul
4	18-Jan to 24-Jan	31	26-Jul to 01-Aug
5	25-Jan to 31-Jan	32	02-Aug to 08-Aug
6	01-Feb to 07-Feb	33	09-Aug to 15-Aug
7	08-Feb to 14-Feb	34	16-Aug to 22-Aug
8	15-Feb to 21-Feb	35	23-Aug to 29-Aug
9	22-Feb to 28-Feb	36	30-Aug to 05-Sep
10	01-Mar to 07-Mar	37	06-Sep to 12-Sep
11	08-Mar to 14-Mar	38	13-Sep to 19-Sep
12	15-Mar to 21-Mar	39	20-Sep to 26-Sep
13	22-Mar to 28-Mar	40	27-Sep to 03-Oct
14	29-Mar to 04-Apr	41	04-Oct to 10-Oct
15	05-Apr to 11-Apr	42	11-Oct to 17-Oct
16	12-Apr to 18-Apr	43	18-Oct to 24-Oct
17	19-Apr to 25-Apr	44	25-Oct to 31-Oct
18	26-Apr to 02-May	45	01-Nov to 07-Nov
19	03-May to 09-May	46	08-Nov to 14-Nov
20	10-May to 16-May	47	15-Nov to 21-Nov
21	17-May to 23-May	48	22-Nov to 28-Nov
22	24-May to 30-May	49	29-Nov to 05-Dec
23	31-May to 06-Jun	50	06-Dec to 12-Dec
24	07-Jun to 13-Jun	51	13-Dec to 19-Dec
25	14-Jun to 20-Jun	52	20-Dec to 26-Dec
26	21-Jun to 27-Jun	53	27-Dec to 31-Dec
27	28-Jun to 04-Jul		

Appendix E.4. Assigned port and weir location codes.

Port and Location Codes
030 - Lazy Bay
031 - Port of Kodiak
032 - Paul's Lake
033 - Thorshiem
034 - Afognak River
035 - Karluk River
036 - Red River
037 - Upper Station
038 - Frazer Lake
039 - Dog Salmon
040 - Akalura River
041 - Uganik River
042 - Malina Creek
150 - King Cove
151 - Port Moller
052 - Dutch Harbor
053 - Akutan
054 - Sand Point
055 - Bear River, ADF&G Camp
056 - Nelson River, ADF&G Camp
057 - Canoe Bay

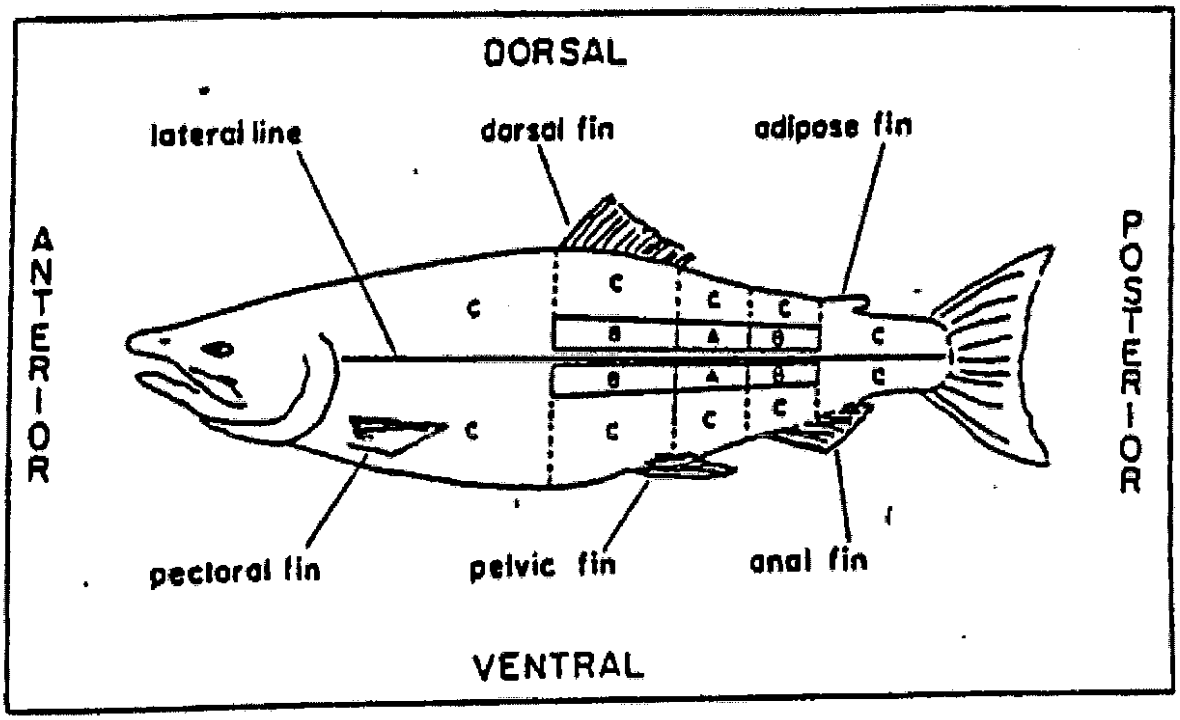
Appendix E.5. Measuring adult fish length, mid-eye to fork of tail.



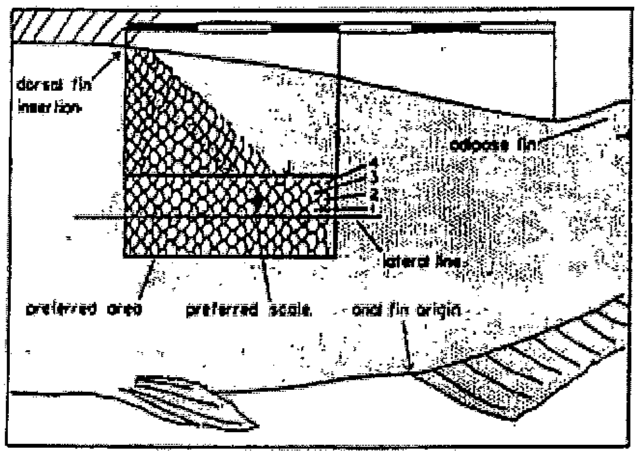
Mid-eye to fork-of-tail lengths are taken because the shape of the salmon's snout changes as it approaches sexual maturity. The procedure for measuring by this method is as follows.

1) Place the salmon flat on its right side (on the measuring board) with its head to your left and the dorsal fin away from you.
2) Slide the fish in place so that the middle of the eye is in line with the edge of the meter stick and hold the head in place with your left hand.
3) Flatten and spread the tail against the board with your right hand.
4) Read and record the mid-eye to fork length to the nearest millimeter.

Appendix E.6. Removal and mounting of the preferred scale.



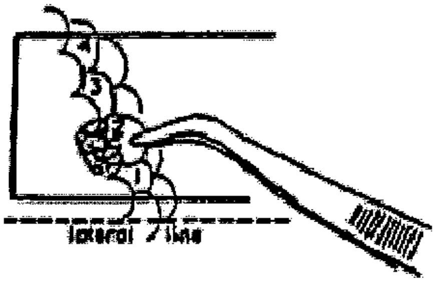
INPFC rated areas for scale removal. Area A is the preferred area. Area B is the second choice if there are no scales in area A. Area C designates non-preferred areas. If scales on the left side of the fish are unusable, try the right side.

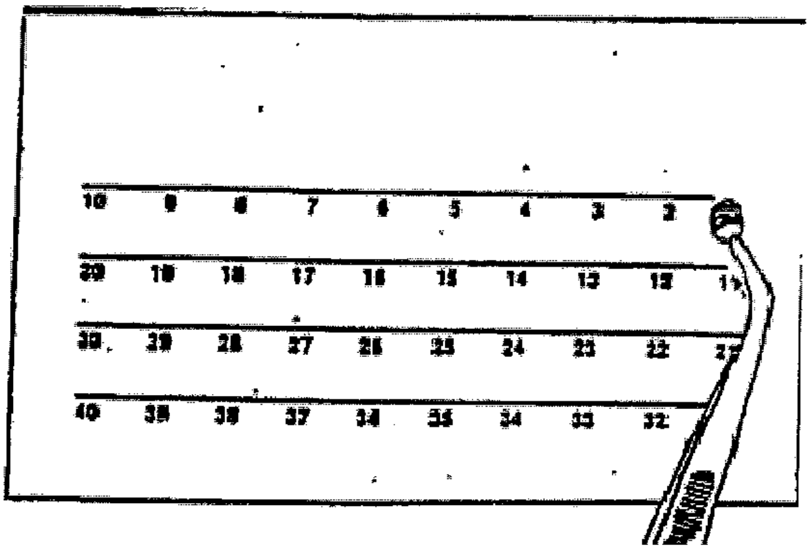


The preferred scale in this diagram is solid black. It is located 2 rows up from the lateral line, on a diagonal line drawn from the insertion (posterior) of the dorsal fin to the origin of the anal fin.

-Continued-

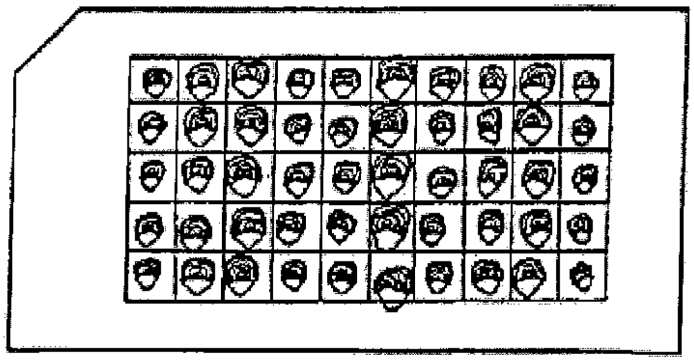
DO NOT TURN SCALE OVER



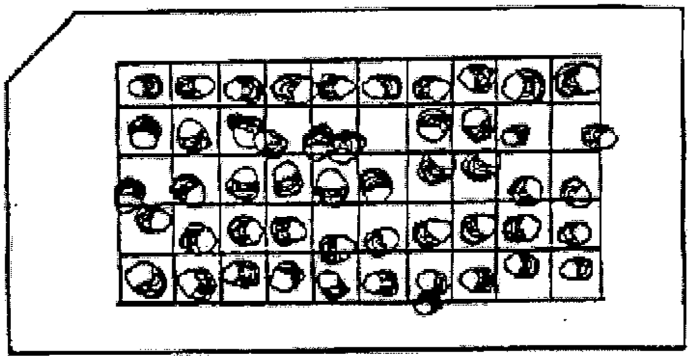


Place the scale directly over the number on the gummed card with the anterior portion of the scale pointed toward the top of the scale.

Appendix E.7. Scale orientation on the gummed card.

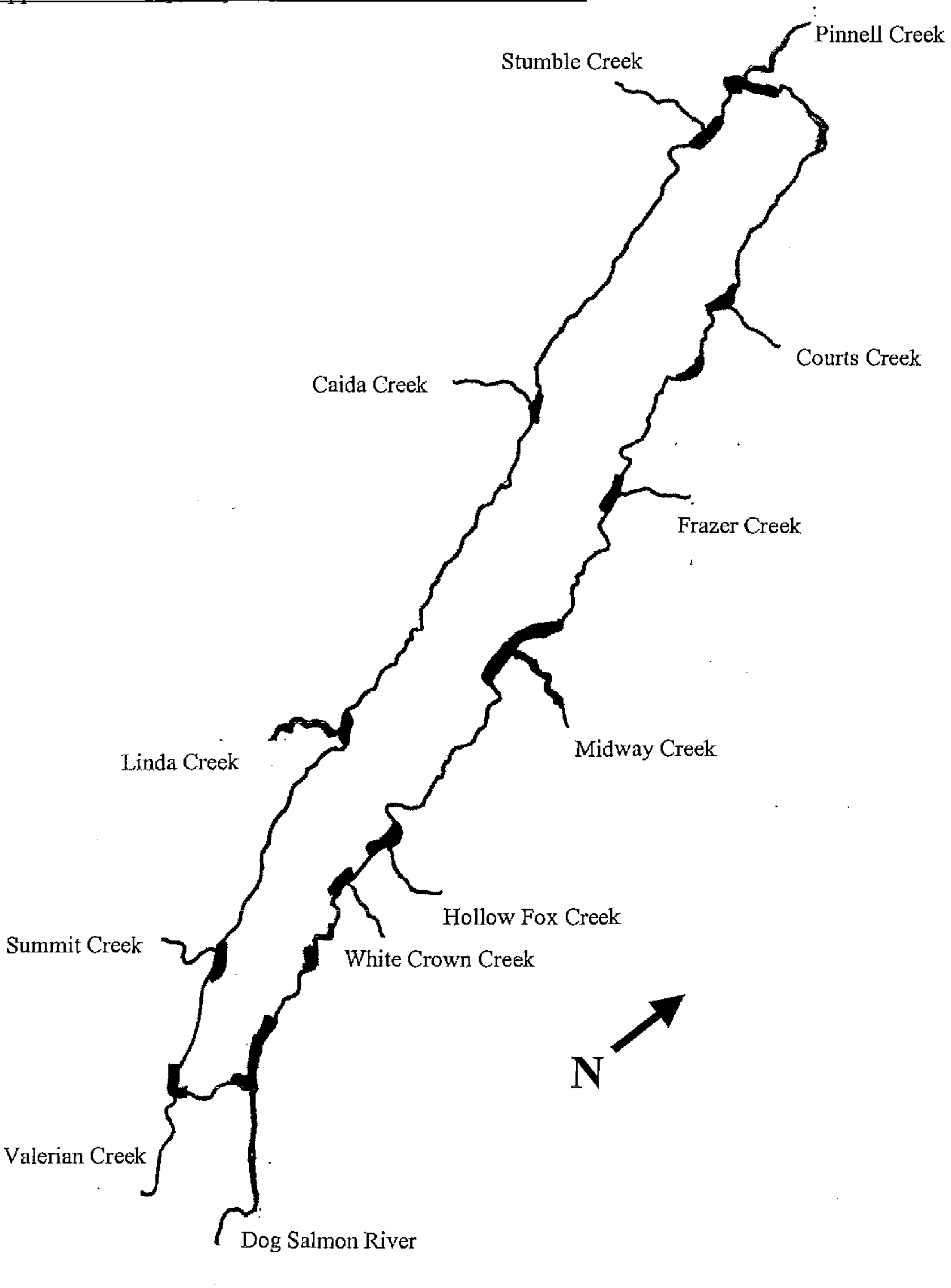


The scales are all correctly oriented on the card in the same direction, with the anterior portion of the scale pointed toward the top of the card.



The scales are all incorrectly oriented. This makes aging scales much more difficult. AVOID THIS!

Appendix F. Map of spawner distribution on Frazer Lake.



KARLUK LAKE SOCKEYE SALMON SMOLT STUDY
OPERATIONAL PLAN, 2002

By
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April 2002

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INTRODUCTION

Karluk Lake is located on the southwest side of Kodiak Island (Figure 1), and is considered one of the largest sockeye salmon *Oncorhynchus nerka* producing systems in Alaska. Some of the earliest recorded commercial harvests of sockeye salmon are from Karluk Lake, dating from the late 1800s. In the early 1900s, sockeye salmon harvests and escapements at Karluk Lake were lightly regulated and overfishing is suspected. A weir was established on the river in 1912 to enumerate escapement, and the White Act was implemented in 1924 to reserve 50% of the run for escapement. Despite these efforts, Karluk Lake sockeye salmon production continued to decline in the 1940s, and did not significantly increase until the late 1970s.

There are several hypotheses on the cause of the decline in Karluk Lake's sockeye salmon production: lower freshwater production, selective overfishing, or long term changes in the ocean conditions.

Smolt studies have been conducted sporadically on Karluk Lake: 1961 though 1968, 1980 through 1984, 1991 through 1992, and the current study (starting in 1999). Age 2. smolt have been the dominant outmigrating age class followed by age 3. smolt. Lake residence time of Karluk sockeye salmon smolt is longer than most systems (Koenings and Burkett 1987). Koenings and Burkett (1987) found that the prolonged lake residence is related to the timing of zooplankton blooms and rearing temperatures. Furthermore, Schmidt et al. (1998) found that competition between early and late run juveniles may impact survival.

The early-run escapement goal range is currently 150,000 to 250,000 fish and the late run escapement goal is 400,000 to 500,000 (Nelson and Lloyd 2001). Schmidt et al. (1998) have suggested that the escapement goal for Karluk Lake should be 800,000 to 1,000,000 and evenly split between the early and late runs. This recommendation would substantially alter the existing overall escapement goal by increasing the early run goal.

A better understanding of Karluk Lake outmigrating sockeye salmon smolt may prove valuable in understanding Karluk Lake sockeye salmon production. In addition, estimates of smolt outmigration abundance may assist in future forecasting of Karluk Lake sockeye salmon run strength.

Goals and Objectives

The Division of Commercial Fisheries' goals for the Karluk Lake sockeye salmon smolt project are to evaluate current escapement goals and to generate pre-season run forecasts. For 2002, specific objectives include the following:

1. Estimate sockeye salmon smolt outmigration abundance and timing.
2. Estimate age composition, length, weight and condition factor of emigrating smolt.
3. Produce a report describing project activities and collected data.

Tasks

Specific tasks leading toward the objective include the following:

1. Setup field the camp.
   The target date to complete this task is May 10.

2. Install and operate Canadian fan traps to capture emigrating sockeye smolt.
   The target date to install the trap is May 11.

3. Enumerate the daily smolt trap catch by species.

4. Conduct weekly sampling of 300 sockeye salmon smolt (60 smolt per day, 5 times per week) for age (scale samples), weight, and length (AWL).

5. Mark 1,100 sockeye salmon smolt weekly using Bismark Brown Y dye. This task is used to estimate the trap efficiency.

6. Collect daily air temperature, water temperature, water level (at the trap and fish pass), cloud coverage, wind direction, wind velocity, and precipitation.

7. Close camp, inventory and store equipment.
   The target date to close the camp is July 7, but this date is dependent on the daily smolt counts.

8. Write Season Summary Report and crew evaluations.
   This task should be started in the field and completed within three days of arriving back into town (target date: July 10).

PROCEDURES

Trap Location, Setup, and Maintenance

Install the Canadian fan trap approximately one mile (1.61 km) downstream from the lake outlet, in the same location used during the 2000 and 2001 smolt study. After the initial setup, make a scale drawing with each of the dimensions (trap and wings), in meters, and location in the river; specifically, indicate distance to right and left banks and the stream current direction. If the trap is repositioned or wing material is added or removed, document that a change was made in the 'comments' section of the *Daily Smolt Catch Reporting Form* (Figure 2) and make a new scale drawing.

Setup the catch-weight station next to the trap immediately after trap placement. The catch-weight station is a small meshed basket suspended over the creek from a hanging scale. Place a holding box, used to hold fish for sampling and dye tests, near the catch box. If necessary, anchor the holding box in place with sand bags inside. Make sure the placement of the box maintains water flow through the box. Place a similar holding box at the dye release site. The stream flow at the dye release site is stronger. In the past, fence posts have been used to help secure the boxes. Devise a method to control the water flow through the box at the release site. Smolt recovering from the dye may become 'pinned' if the current is too strong.

Check the trap as often as necessary to minimize fish mortalities. At a minimum, check the trap every hour between sunset and sunrise. During daylight hours, a check once every four hours is usually adequate. Make the last check at the conclusion of the smolt day (1200 hrs). Although smolt generally migrate in the evening hours, smolt may migrate in the mid-afternoon hours especially during changes in weather conditions. **It is essential that crew keep a close watch on the smolt trap to avoid significant mortality due to crowding.**

Species Identification and Enumerating the Catch

Handle sockeye salmon smolt gently because they are very sensitive to any stress, and mortality can occur with the loss of just a few scales. Identify and count the entire catch by species. Species identification keys are provided in Appendix A. It is the responsibility of the crew leader to ensure that the crew uses the keys to properly identify the catch.

There are two methods used to determine the number of fish caught in a trap. The simplest and most common procedure is to individually count the fish by species while emptying the live box with a dip net; record this number on the *Daily Smolt Catch Reporting Form* (Figure 2). The second method used is the catch-weight sampling procedure where the catch is transferred by dip net into the small meshed basket suspended over the creek from a hanging scale. **Only use this second method (catch-weight) when there are large numbers of smolt being caught, and there is not enough time to count all the fish without incurring mortalities.** During the catch-weight sampling process, take samples to determine species count by weight. This involves counting the number of fish by species from a known aggregate weight obtained using the hanging scale. Generally, the rule is to sample every tenth dip net of fish for a species count by weight. Record the aggregate weight of the catch on the *Catch-Weight Sampling Form* (Figure 3) until the live box is emptied or until they can be individually counted. When you use the catch-weight method, note its use in the 'comments' section of the *Daily Smolt Catch Reporting Form.*

The last daily smolt count is at 1200 hrs, which will complete the smolt enumeration for that 'smolt-day'. Record the daily total on the *Sockeye Salmon Smolt Summary Form* (Figure 4).

Trap Efficiency

Estimate the trap efficiency once per week by marking sockeye salmon smolt, releasing them upriver, and counting the number of recaptured smolt. Mark sockeye salmon smolt using Bismark Brown Y (BBY) dye. Perform the process in the early evening (1900-2100 hrs) to coincide with natural outmigration timing. Keep in mind that the dyeing process is stressful on sockeye salmon smolt. Try to minimize as much stress as possible in the dyeing process by reducing excessive handling (netting), minimizing bright light (keep containers covered), maintaining cooler water temperature throughout the process (including transport and dyeing), and limiting exposure to the dye to the minimum amount of time to stain the smolt. Any of these stresses can cause mortality alone, so avoid situations that may combine these sources of stress. Follow these steps during the mark-recapture process:

1. **Collect 1,100 to 1,125 sockeye smolt.** Collect smolt once per week for the dye test, preferably on large outmigration days. Use the holding box adjacent to the trap to hold smolt. If you are unable to collect 1,100 smolt in a single night, try to collect fish over two days; however, do not hold smolt for more than three consecutive nights when trying to collect the 1,100 for marking. It is better to perform the test on a smaller number of fish than to hold fish for a longer time. Regardless, use a minimum of 500 smolt during the dye test. At the beginning of the dye test, record the time, water temperature, and number of smolt on the *Smolt Dye Release Form* (Figure 5).

2. **Set up dyeing station at release site.** Use the same release site that was used during the 1999, 2000, and 2001 studies, which is approximately 0.5 miles upstream from the trapping location. This site is just downstream from Silver Salmon Creek and adjacent to the location of the old smolt trap site (old camp lumber is still on the bank). Place a holding box in the stream, preferably in a "pool" area, while marking smolt. Assemble other marking equipment: 30 gallon garbage can or tote, Bismark Brown Y dye, supplemental oxygen (0_2 bottle, regulator, tubing, air stone), aerators, thermometer, and logbook.

3. **Move smolt to release site.** Place a trashcan in the raft and fill it half full with water. Count smolt from the holding box into the trashcan. Transport smolt in the 55-gallon trash can with four aerators attached to the lid to provide aeration. When water temperatures increase, make two trips with one-half the smolt transported on each trip.

   Move smolt quickly but avoid 'sloshing' the water in the trashcan. Prior to transport, record the water temperature. Record any mortalities that occur immediately following the transport. In 1999, marking and transport tasks were combined, which resulted in some smolt mortality. In 2000 and 2001, tasks were split (transport, dye, and recovery), which resulted in less mortality. Continue to split the tasks in 2002 (i.e., transport and then dye smolt).

4. **Dye and release smolt.** Upon reaching the release site, hold the smolt in a live box or tote anchored in the stream for a minimum of 30 minutes (preferably letting them recover from the transport for up to an hour). Record the water temperature at the start of the recovery period and any mortality at the end of the recovery period. If the stream temperature is > 8° C or there are obvious signs of stress, oxygenate the water in the live box or tote using the portable aerators and/or oxygen bottle.

   For dyeing the smolt, use 1 gram of BBY dye per 8 gallons of water. Mix water (15 gallons) and dye (1.9 g) in a 30-gallon container. Use an aerator and supplemental oxygen to maintain the oxygen level. Before immersing smolt, record the water temperature in the dye container. Using a dip net, place the smolt into the dye/water mixture; keep smolt in the mixture for 30 minutes. Keep the dye container (with the lid on) in the stream to maintain ambient water temperature. After the smolt are dyed, record any mortality that occurs and place the live smolt into the instream holding box until release; release smolt between 2200 and 2300 hrs. At the time of release, transfer only the healthy smolt to water filled buckets and release them evenly across the stream. Record the number of healthy smolt released, time of release, stream temperature and other data on the *Smolt Dye Release Form* (Figure 5). Retain at least 100 healthy smolt in the instream live box (record the actual number on the *Smolt Dye Release Form*); these smolt will be used to monitor mortality induced from the dye. To prevent bird or otter predation on retained smolt, make sure to anchor and cover the box securely. Dispose of all sick and dead smolt in a manner that will not attract animals or influence trap catches (i.e., release below the trap).

5. **Examine for marked smolt.** Following the release of the dyed smolt, examine the smolt catch for marked fish. Continue monitoring for marked fish until the noon (1200 hours) of the day preceding the next dye test. The first day of smolt examination is the day of release. Calculate trap efficiency from the number of marked fish recovered relative to the number of fish released. Record mark recapture data on *the Daily Smolt Catch Reporting Form* (Figure 2), and summarize the data on the *Sockeye Salmon Smolt Summary Form* (Figure 4). Remember that the number of smolt examined in a day equals the number of marked and unmarked smolt caught that day. **Daily smolt catch will then equal the number examined minus the number marked because marked smolt were previously counted.**

   There might be occasions when all the smolt are not individually counted. These will be limited to the following: 1) too many smolt outmigrating to count individually without incurring mortality (i.e., using catch-weight methods) or 2) a problem with the trap. If all fish are not examined, be sure to record it with an explanation in the 'comments' section of the *Daily Smolt Catch Reporting Form* (Figure 2).

   Dyed fish that are found dead on the wings or in the trap should be included in the total number of recaptures and also noted in the comments.

6. **Monitor the instream live box for smolt mortalities.** Once each evening for three days after a test at approximately 1800 hrs, count and remove any dead smolt in the instream holding box; attempt to do this quickly and without stressing the smolt unnecessarily. Record the number of dead smolt on the *Smolt Dye Release Form* (Figure 5). On the fourth day after initiating a dye test, release the remaining dyed smolt from the instream live box downstream of the trap.

Age, Weight, and Length Sampling

Sample 60 sockeye salmon smolt per day, five days per week for age, weight and length. If daily sampling objectives are being met, sampling will not occur on Wednesday and Sunday. Specific procedures for collecting and recording the information are in Appendix B. Obtain samples randomly (see Appendix B) from a single day's catch, and do not mix samples between days. If less than 60 smolt are caught in a day, the sample size for that day will be the number of fish caught on that day. **Smolt primarily migrate at night; therefore, a single sampling day will be the 24-hr. period from noon to noon and will be identified by the calendar date corresponding to the first noon.**

Climate Data

Collect climate data at approximately 1800 hrs. Record this information on the *Weather Observation Form* (Figure 6). Climate data includes: water and air temperatures (°C), stream height (cm), estimated percent cloud cover, and wind direction and velocity.

CREW LEADER RESPONSIBILITIES

Season Summary Report

The crew leader is responsible for writing a season summary report. This report may be written in the field, or it may be written in the office at the end of the season. The summary report should be a brief synopsis of the field season and include the following: (1) a chronology of sampling events and data collection, (2) problems incurred during the season including sampling and field camp operations, (3) suggestions for improvements/modifications to the enumeration and sampling programs, (4) a list of equipment/building supplies that are required for following field season, and (5) an accurate log of fuel and bottled oxygen consumption.

Daily Radio Schedule

Report daily and cumulative smolt catch, dye test information, and current trap efficiency, at approximately 1320 hours on frequency 3.230 MHz Monday through Friday and 2030 on Saturdays and Sundays. This information should be recorded on the *Daily Smolt Radio Schedule Reporting Form* (Figure 7) and carefully edited prior to radio schedule. In addition to relaying information, radio schedules are the primary means for determining crew safety. Failure to make radio schedule for two consecutive meetings will result in an emergency visit by ADF&G staff to verify the safety of the crew.

ALL FIELD PERSONNEL WILL BE AWARE OF EMERGENCY CONTACT PROCEDURES POSTED ON EACH RADIO. The emergency Coast Guard frequency is **4.125 MHz.** The Karluk Smolt camp is located **57° 23' N lat.; 154° 03'W long**. Crew leaders must train crewmembers in the proper use the SSB radio.

Air Charters

Kodiak staff set up all air charters and logistics; field crews do not set up air charters. Relay appropriate information in regard to charters through daily radio contact. It is important to label items sent back to town with the instructions (e.g., my phone number; 486-1848). Contact office personnel when any data, equipment, or other freight will be "back hauled" to Kodiak.

Time Sheets and Leave

During the field season, crewmembers are responsible for keeping track of their working time. Recorded time on the time sheets should be 'actual hours' spent on the project. Obviously, there is a finite budget and a list of priorities. Tasks should be completed in their order of importance without accruing too much overtime. Generally, most projects can be finished within normal working hours; however, there will be occasions when the normal working day (i.e., 7.5 hours) is insufficient to complete the necessary tasks. When these situations occur the crew will work longer and record the overtime. If unusual circumstances arise that necessitate extensive overtime, the project leader should be notified immediately.

Data Management

An important duty of the crew leader is to properly record and safely store the collected data. During in-town training the project leader will review the different biological measurements and the proper way to fill out the data forms with the crew leader. In the field it is the crew leader's responsibility to ensure that measurements are being taken properly and accurately. The crew leader is also responsible for ensuring that the forms are completed correctly and neatly. Ensuring neatness may seem like an unnecessary time burden, but it is a very important aspect of the crew leader's responsibilities. Collected data are scanned and errant or missing marks may erroneously become part of the database. Clear and well-organized data reflect highly on the crew leader and the crew.

Purchasing

In town, only purchase items authorized by the project leader. During the field season, field crews require additional items (e.g., groceries, fuel, and tools). Small lists may be read over the radio during the scheduled radio meeting; however, these lists should be limited to just a few items. Remember that radio time is limited and there are a number of other camps, region-wide, that use the same frequency. Longer lists of materials should be sent to town on supply flights. Crew leaders should track grocery expenses and limit the number of requested specialty items. Similar planning should be made for fuel. Fuel is a necessity for many camp operations including heating the weatherport. However, past crews have left stoves burning during the day while working outside, unnecessarily burning fuel; these situations should be minimized.

Camp Inventory and Close Up

Inventory the camp for all gear prior to camp close up. Items of high value should be returned to Kodiak and stored in the Kodiak Research locker; some items may be stored at the Frazer Lake fish pass facility. The weatherport platform and other buildings should also be secured prior to leaving the field. Do not leave equipment at the dye site, and make sure the camp looks clean and orderly prior to your departure. Make sure the smolt trap is secured on the bank and tied to the willow trees.

Photo Documentation

The crew leader is responsible for photo documenting project activities. Specific aspects such as trap installation, dye site, smolt sampling, and other detailed tasks are important to photograph. When possible, ADF&G cameras and film will be used. If State cameras are not available, film will be provided for use with personal cameras. The use of personal cameras is suggested in this case, but not required.

Specific photos needed for the 2002 season include:

1. Sequential photos from Karluk Lake to the project site.
2. Details of dye test, specifically showing crewmembers performing tasks.
3. Crewmembers counting smolt.
4. Crewmembers taking smolt measurements.
5. Trap and wing placement from several angles – including holding box and catch-weight station. Be sure to give perspective to location of the trap relative to the left and right stream banks.
6. Details around camp including the weatherport platform and interior.

Carbon Monoxide

Two years ago an employee working at a remote field camp was exposed to excessive levels of carbon monoxide from a non-vented kerosene heater. The employee became quite ill, was briefly hospitalized in Kodiak, and received oxygen therapy before recovering from the exposure.

The misuse and/or use of improperly maintained or aging equipment fueled by kerosene or propane such as heaters, stoves, and refrigerators increase the danger for carbon monoxide poisoning. This is a serious issue because carbon monoxide gas is fatal. Carbon monoxide is an invisible, odorless, tasteless gas produced when fossil fuels do not burn completely, or are exposed to heat (usually fire). Symptoms of carbon monoxide exposure include:

Mild Exposure-Slight headache, nausea, vomiting, fatigue (flu-like symptoms).

Medium Exposure-Throbbing headaches, drowsiness, confusion, poor judgment, dizziness, vertigo, fast heart rate.

Extreme Exposure-Convulsions, unconsciousness, heart and lung failure. Exposure to carbon monoxide can cause brain damage and death.

If you experience any of these symptoms and suspect carbon monoxide poisoning, immediately move into an area with fresh air flow and avoid all contact with the suspected source of carbon monoxide until symptoms dissipate, and contact the ADF&G office to notify them of the problem.

It is essential that all employees review operating instructions for all equipment, which burn wood, charcoal, oil, natural gas, gasoline, kerosene, or propane. Crew leaders must inspect all equipment to assure each item is in good working order and, if applicable, is properly ventilated. As a safety precaution, each camp will be provided with a carbon monoxide detector.

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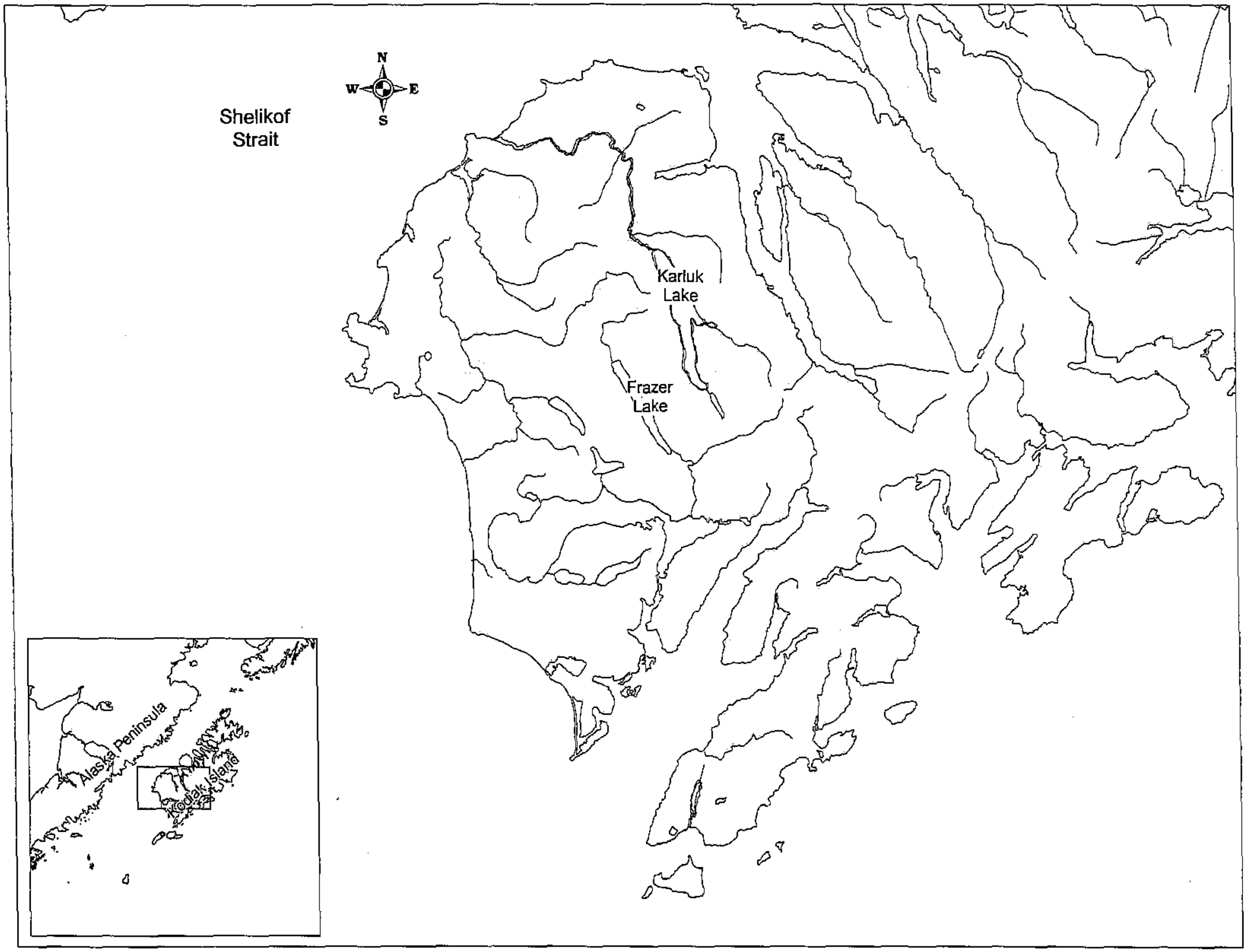

Figure 1. Location of Karluk Lake on Kodiak Island.

DAILY SMOLT CATCH REPORTING FORM

TRAP NUMBER ______________________ PROJECT LOCATION ______________________ DATE __________

TIME MILITARY	SOCKEYE SMOLT (NUMBERS)			OTHER (NUMBERS)			COMMENTS[2]
	CATCH[1]	EXAMINED FOR MARKS	MARKED RECOVERIES	COHO	DOLLY V.	STICKLEB.	
TOTAL							

[1] Catch number does not include marked recoveries.
[2] To be included in comments: estimate young-of-year fry numbers by species and number of sockeye smolt mortalities.

Figure 2. Daily smolt catch reporting form.

CATCH-WEIGHT SAMPLING FORM

Date: ________________ Time: _____to_____ Project Location ____________________

Basket weight (wet): ____________________

Basket #	Weight (fish+ basket)	Basket #	Weight (fish + basket)	Basket #	Weight (fish+ basket)	Basket #	Weight (fish+ basket)
1		11		21		31	
2		12		22		32	
3		13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	
TOTAL:		TOTAL:		TOTAL:		TOTAL:	
GRAND TOTAL ________			LESS BASKET WEIGHTS ________		= ________		(a)

Sample Biomass (Fish plus basket weight)	CATCH	
	Sockeye Smolt	Other
1		
2		
3		
4		
TOTAL:	(c)	(d)

GRAND TOTAL ________	LESS BASKET WEIGHTS ________	= ________	(b)

ESTIMATED CATCH:	SMOLT (ac/b):	OTHER(ad/b)

Figure 3. Catch-weight sampling form.

SOCKEYE SALMON SMOLT SUMMARY FORM

PROJECT LOCATION: ____________________

TRAP
NUMBER: ____________________

	NUMBER OF SMOLT					
	CAUGHT[2]					MARKED[3]
DATE[1]	DAILY	CUMULATIVE	MORTALITIES	DYED	EXAMINED	RECOVERIES

[1] Each date covers a 24-hour period extending from noon to noon and identifies the starting date.
[2] Numbers of fish caught does not include marked recoveries.
[3] Marked recoveries are not included in the catch because they represent previously caught smolt.

Figure 4. Sockeye salmon smolt summary form.

SMOLT DYE RELEASE FORM

DATE: ______________________ CREW: ______________________

PROJECT LOCATION: ______________________

NUMBER OF FISH
COLLECTED: ______________________
(from live box)

	COLLECTION LIVE BOX	TRANSPORT BUCKET	RECOVERY CONTAINER	DYE TUB	RECOVERY CONTAINER	TRANSPORT BUCKET	STREAM RELEASE
START TIME (military)							
START TEMP (degree celsius)							
MORTALITY (number of fish)							
OXYGEN SUPPLEMENT O_2 or aerator(A)							

DYE SOLUTION (mixture): ____________ DYE (grams); ____________ WATER (gallons)

RELEASE SITE LOCATION (distance upstream of trap site, in miles) ______________________

TOTAL NUMBER OF DYED FISH RELEASED: ______________________

COMMENTS:

Figure 5. Smolt dye release form.

CLIMATOLOGICAL OBSERVATIONS

Project Location: ______________________

DATE	TIME	TEMPERATURE		CLOUD	WIND		STREAM GAUGE[1]	COMMENTS
		AIR (^{o}C)	WATER (^{o}C)	COVER (%)	DIRECTION	VEL. (MPH)	(cm)	

[1] Round to nearest 1 cm.

Figure 6. Weather observation form.

DAILY SMOLT RADIO SCHEDULE REPORTING FORM

PROJECT: ______________________________

SMOLT DATE	INDEX TRAP SMOLT CATCH		DYE RELEASE	NUMBER RECAPTURES	CURRENT TRAP EFFICIENCY	COMMENTS: (INCLUDED # AWL SAMPLED)
	DAILY	CUMULATIVE				

Figure 7. Radio schedule report form.

APPENDIX

Key to Field Identification of Anadromous Juvenile Salmonids in the Pacific Northwest

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ABSTRACT

A key is presented with descriptive illustrations to help in field identification of live, juvenile salmonids in fresh waters of the Pacific Northwest. Other juvenile fish that may be mistakenly identified as salmonids are included.

INTRODUCTION

Species identification of live, anadromous juvenile salmonids is frequently a problem to the field biologist. The purpose of this key is to list and illustrate the external characteristics which will expedite field identification of juvenile salmonids in the Pacific Northwest.

Five species of Pacific salmon (pink, chum, sockeye, chinook, and coho); four species of trout (cutthroat, brown, Dolly Varden, and rainbow or steelhead); and other juvenile and adult fish [1] that may be mistaken for salmon or trout in fresh water are described in this key.

USE OF KEY

The characteristics for identification are listed in a series of alternative statements, some of which are illustrated. To use the key, examine the first statement; if applicable, proceed to the next and continue to successive statements until the species is identified. If a statement is not applicable, pass to the alternative characteristics indicated by numbers in parentheses (numbers on the drawings correspond to numbers of statements in the key). Continue in this manner until the specimen is identified. Some external characteristics are positive separating features (marked with asterisk), whereas others are not. Therefore, two or more statements should be considered before final rejection. If a precise identification cannot be made using the external characteristics —and the fish can be sacrificed, a positive identification can usually be made from internal features (marked with double asterisks). A bibliography of keys that utilize more descriptive internal characteristics is included in this paper.

[1] Especially adult smelt, family Osmeridae.

KEY

1. (47) Adipose fin and scales present. (Fig. 1)
2. (48) Fleshy appendage at base of pelvic fins present.
3. (49) Mouth large, reaching at least to center of eye.

Family Salmonidae

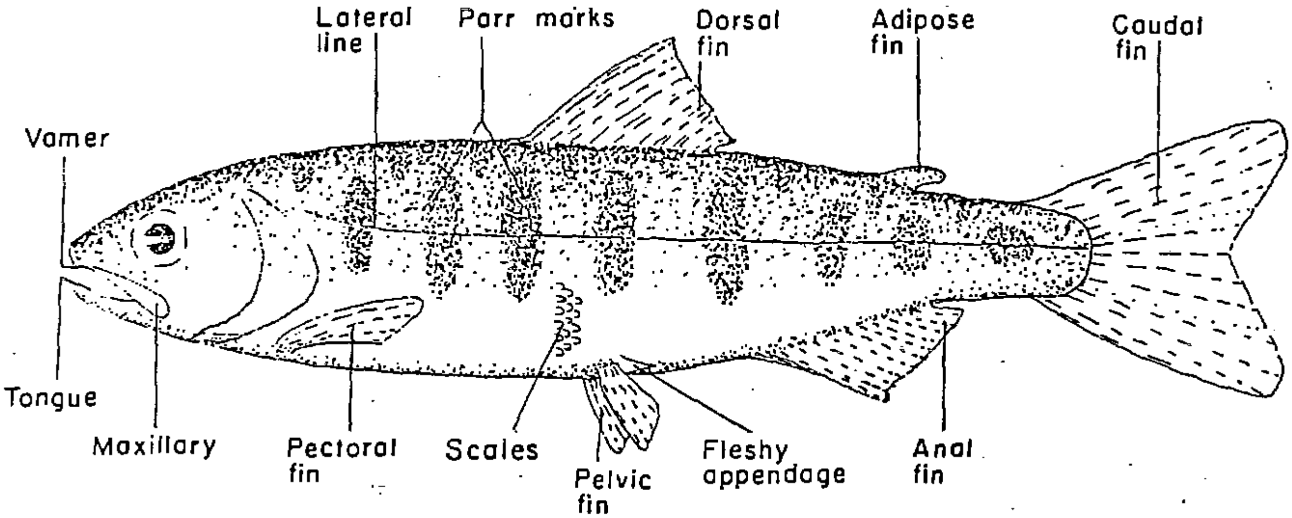


Figure 1.—A hypothetical salmonid showing external characteristics.

4. (17) Anal fin higher than long, with 8 to 12 developed rays (Fig. 2A)
5. (52) *Teeth on head and shaft of vomer. (Fig. 3A)

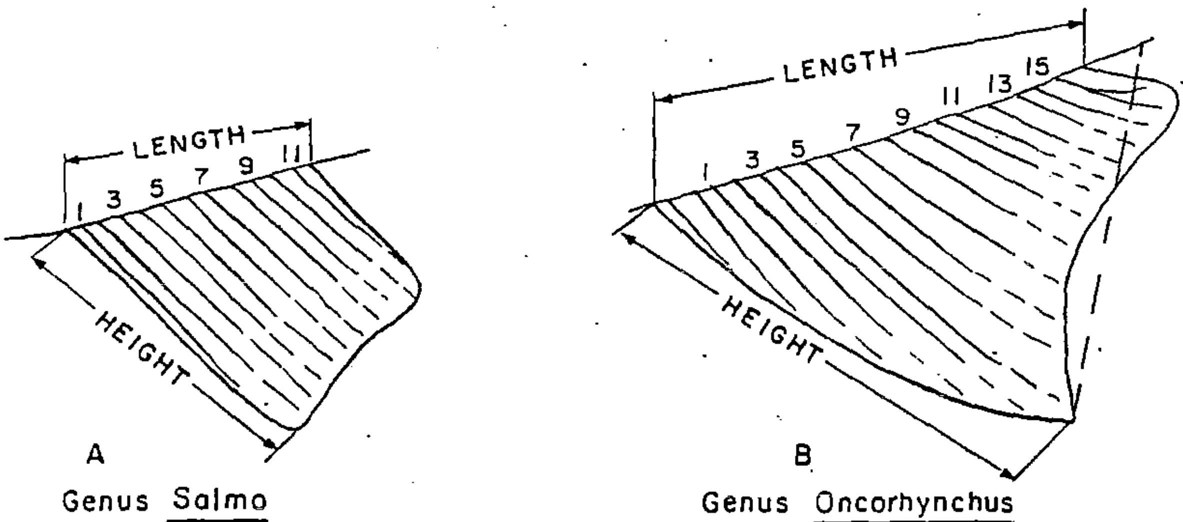


Figure 2.—Anal fins: (A) Trout, genus *Salmo;* (B) Pacific salmon, genus *Oncorhynchus.* The two drawings show differences in structure and fin ray count. (Note that the length of the anal fin is its overall basal length, and its height is that distance from the origin of the fin to the tip of the anterior lobe. In counting fin rays, include only those which originate from the base and terminate at the outer margin of the fin or are half as long as [or greater than] the longest ray.)

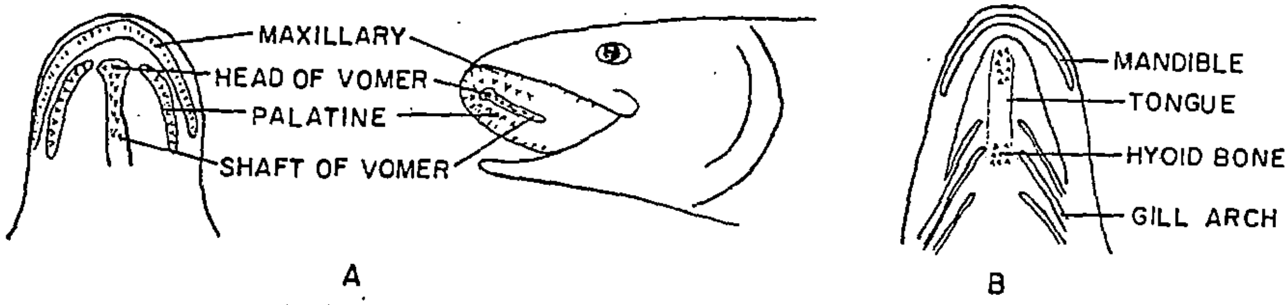
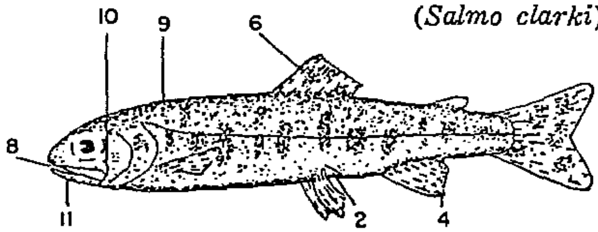


Figure 3.—Location of dentition in (A) the roof and (B) the floor of the mouth of salmonid fishes. (Presence or absence of teeth on the vomer or tongue may be determined by use of the little finger or a blunt instrument. The small hyoid teeth at the base of the tongue are located between the gill arches of the lower jaw and are difficult to find.)

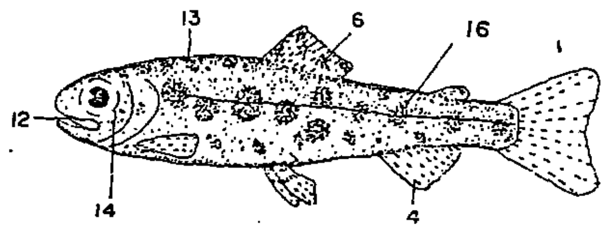
6. (18) Dorsal fin with large dark spots.
Trout
Genus *Salmo*

7. (53) Adipose fin not orange; no row of pale round spots along lateral line.
8. (12) *Small hyoid teeth at base of tongue. (Fig. 3B)
9. (13) Not more than five parr marks on mid-dorsal ahead of dorsal fin.
10. (14) Maxillary reaching past posterior margin of eye.
11. (15) Red or yellowish hyoid mark under lower jaw. Tail usually black spotted.
Cutthroat trout
(*Salmo clarki*)



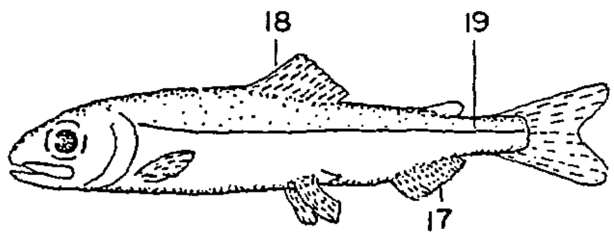
12. (8) *No teeth at base of tongue.
13. (9) Five to 10 parr marks along mid-dorsal ridge ahead of dorsal fin.
14. (10) Maxillary short, not reaching past posterior margin of eye.
15. (11) No hyoid mark under lower jaw. Few or no spots on tail.

16. (20) Parr marks almost round.
Rainbow or
steelhead trout
(*Salmo gairdneri*)



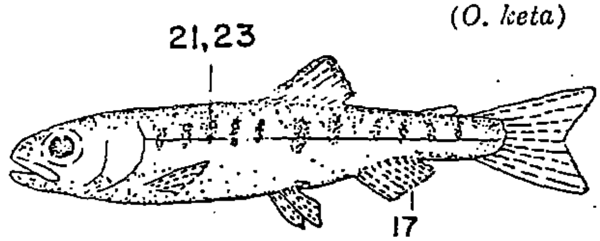
17. (4) Anal fin longer than high, with 13 or more developed rays. (Fig. 2B)
18. (6) Dorsal fin without large dark spots, may be black tipped.
Pacific salmon
Genus *Oncorhynchus*

19. (20) No parr marks. Fry leave fresh water while small—approximately 1.75 inches (45 mm) long.
Pink salmon
(*O. gorbuscha*)



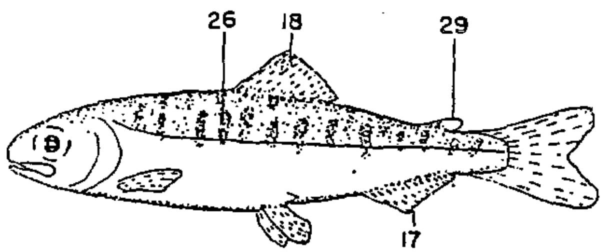
20. (16) Parr marks present as vertical bars or oval spots.
21. (30) Parr marks short, extending little, if any, below lateral line.
22. (25) Gill rakers on first arch, 19 to 26. ** Pyloric caeca, 140 to 186.
23. (26) Parr marks faint. Sides below lateral line iridescent green.
24. (27) Small when migrating from fresh water, approximately 1.5 inches (40 mm) long.

Chum salmon
(*O. keta*)



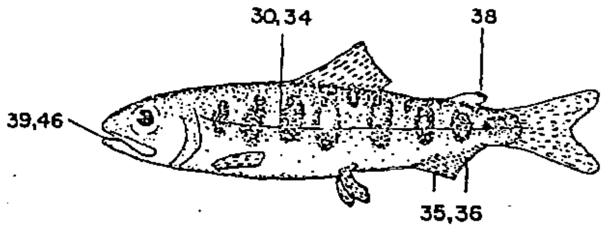
25. (22) Gill rakers on first arch, 30 to 40. **Pyloric caeca 60 to 115.
26. (23) Parr marks usually sharply defined. Sides below lateral line silvery, not iridescent green.
27. (24) Relatively large when migrating from fresh water, approximately 3 to 5 inches (80 to 126 mm) long.
28. (31) Gill rakers long and slender, more than 29 on first arch.
29. (32) Adipose fin clear, not pigmented.

Sockeye salmon
(*O. nerka*)



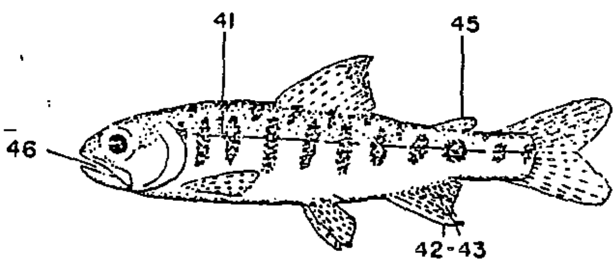
30. (21) Parr marks large, vertical bars centered by lateral line.
31. (28) **Gill rakers short and thick, fewer than 29 on first arch.
32. (29) Adipose fin at least partially pigmented.
33. (40) **Plyloric caeca more than 90.
34. (41) Parr marks broader than interspaces.
35. (42) Anterior rays of anal fin not distinctly longer than rest, not white edged.
36. (43) Anal fin not pigmented.
37. (44) Black spots, when present, on both lobes of caudal fin.
38. (45) Adipose fin not completely mottled, clear area at anterior base of fin.
39. (46) Black gums along base of lower teeth.

Chinook salmon
(*O. tshawytscha*)



40. (33) **Plyloric caeca less than 80.
41. (34) Parr marks narrower than interspaces.
42. (35) Anterior rays of anal fin elongated; when depressed they extend to base of last ray. (Fig. 2B)
43. (36) Anal fin pigmented between rays, resulting in black banding.
44. (37) Black spots, when present, on upper lobe of caudal.
45. (38) Adipose fin completely pigmented.
46. (36) Mouth gray to white.

Coho salmon
(*O. kisutch*)



47. (1) Adipose fin not present; scales present or lacking.
Not Salmonidae

48. (2) No fleshy appendage at base of pelvic fins.
Smelts
Family Osmeridae

49. (3) Mouth small, not reaching center of eye; teeth weak or absent.

50. (51) Depressed dorsal fin, shorter than head.
Whitefishes
Genus *Coregonus*

51. (50) Depressed dorsal fin, longer than head.
Arctic grayling
(*Thymallus arcticus*)

52. (5) **Teeth on head of vomer only.
Chars
Genus *Salvelinus*
Dolly Varden (*S. malma*)

53. (7) Adipose fin orange; row of distinct pale round spots along lateral line.
Brown trout
(*Salmo trutta*)

ACKNOWLEDGMENTS

We especially thank Dr. Arthur D. Welander, Professor of Fisheries, and Dr. Bruce S. Miller, Research Biologist, College of Fisheries, University of Washington, Seattle, for their valuable suggestions. We also thank Galen H. Maxfield, Fishery Biologist, and Dr. Alan J. Beardsley, Fishery Biologist, both from the NMFS Northwest Fisheries Center, Seattle.

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Appendix B.1. Procedures for sampling salmon smolt for age, weight, and length data.

The sample size is 60 sockeye salmon smolt per day, five days a week. If daily sampling objectives are being met, sampling will not occur on Wednesday and Sunday. When possible, smolt collected for sampling should be taken throughout the night rather than at a single time interval. It is essential that the sample be taken randomly. In the event that more than the required sample size is in the smolt trap at the time of sampling, the trap should be stirred to assure randomness. When the smolt are randomly distributed, a small dip net should be used to remove a subsample. This procedure should be repeated until the sample size goal is met.

AWL Forms

Smolt length and weight will be recorded on AWL forms (Appendix B.2). Using a No. 2 pencil, complete each section of the left side of the AWL and darken the corresponding blocks:

Description: Include species (sockeye smolt), location, year, and sampler's names.

Card: The AWL forms and corresponding slides are numbered sequentially by date throughout the season starting with # 001. A new, consecutively numbered, card is used each day even if the previous card is not completed. There may be a minimum of one fish and a maximum of 40 fish (8 slides) per AWL.

Species: Refer to the reverse side of the AWL form to obtain species; sockeye = 2.

Day, Month, Year: Use the appropriate digits for the date the fish are sampled.

District, Subdistrict, Stream, Location:

	District	Subdistrict	Stream
Karluk	255	10	101

Period: List the period in which the fish were sampled using Appendix B.3.

Project: Use code 8 for smolt projects.

Gear: Refer to the reverse side of the AWL form to obtain code; 00 = trap.

-Continued-

Mesh: Leave blank.

Type of Length Measurement: Refer to the reverse side of the AWL form to obtain code; 1 = Tip-of-snout to fork-of-tail; see appendix B.4.

Number of Scales: Mark 1 (refers to 1 smear/fish)

# of Cards: Mark 1 (each AWL form is individually numbered)
Keep the litho codes in numerical order throughout the season and **be sure to transfer the litho code from the front left side to the backside of the AWL form.** These forms will be optically scanned and stray marks may be misinterpreted. **It is the crew leaders responsibility to make sure that all forms are carefully edited before returning them to your supervisor.**

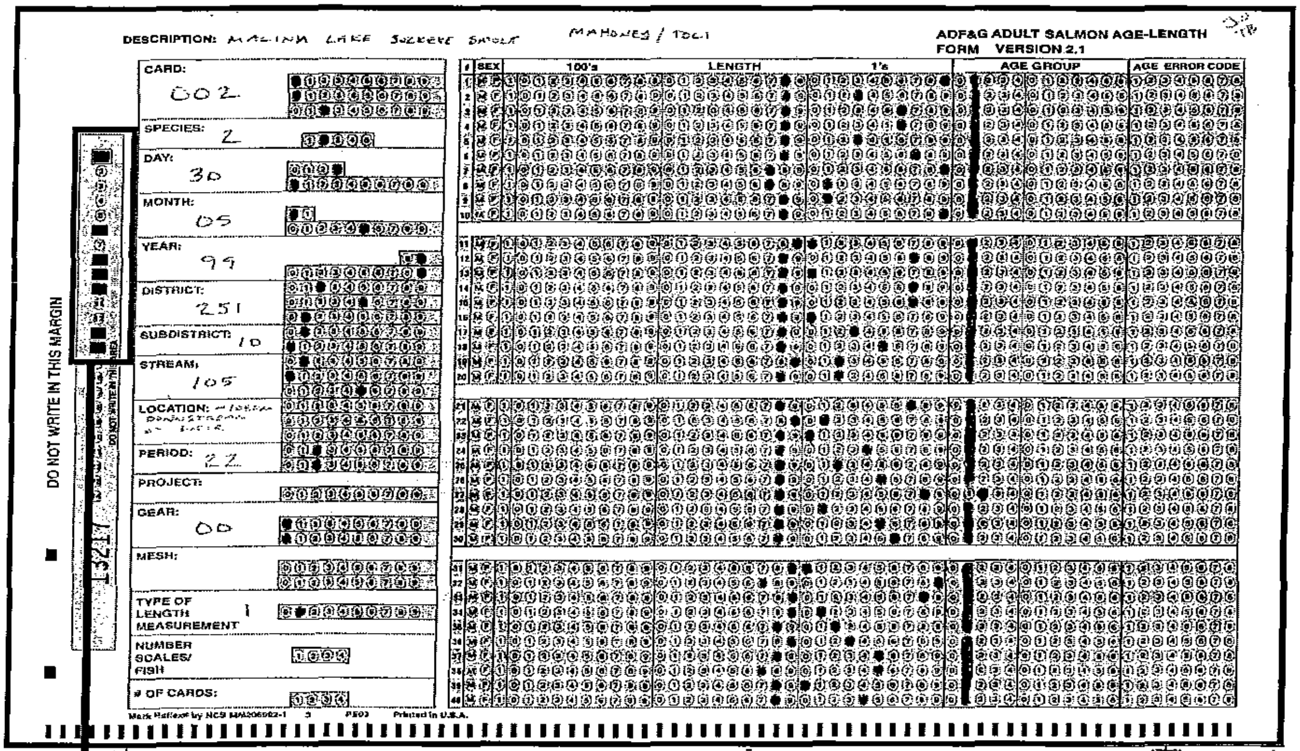
Sampling procedure

Smolt should be kept alive and sampled the day of capture. Use MS222 to anesthetize the fish. Too much MS222 can be fatal, so measure carefully and only add a few smolt at one time. A flattened probe or a razor edge will be used to remove 5-10 scales from the preferred area, consult Appendix B.5. Mount the scales on a glass side. Be sure to **wipe the probe off after mounting the scales for each fish** to minimize mixing scales from the previous fish. Try to separate scales without overlap. The left portion of each slide should be labeled: location, date, AWL # (card #), and fish numbers (1-5, 6-10, 11-15, etc.). Labeling is demonstrated in Appendix B.6. If the slides are frosted, write on them using pencil or permanent marker, if the slides are not frosted make sure you have small labels prior to leaving for the field. When the slides are completed, return them to the box in order, and label the box. To fit more slides in a box, flip the labeled end on alternating slides. Make sure the label on the box is complete, so that they will not be confused with other project's data. Smolt lengths will be measured in **millimeters** from the tip of the snout to the fork of the tail. Record each length by darkening the appropriate column blocks on the AWL form.

Individual smolt weights should be recorded to the nearest 0.1 gram on the backside (and on the right side) of the AWL form. Keep the container that contains the smolt on the scale wet and re-zero with the water. Do not dry off smolt with paper towels during the sampling process.

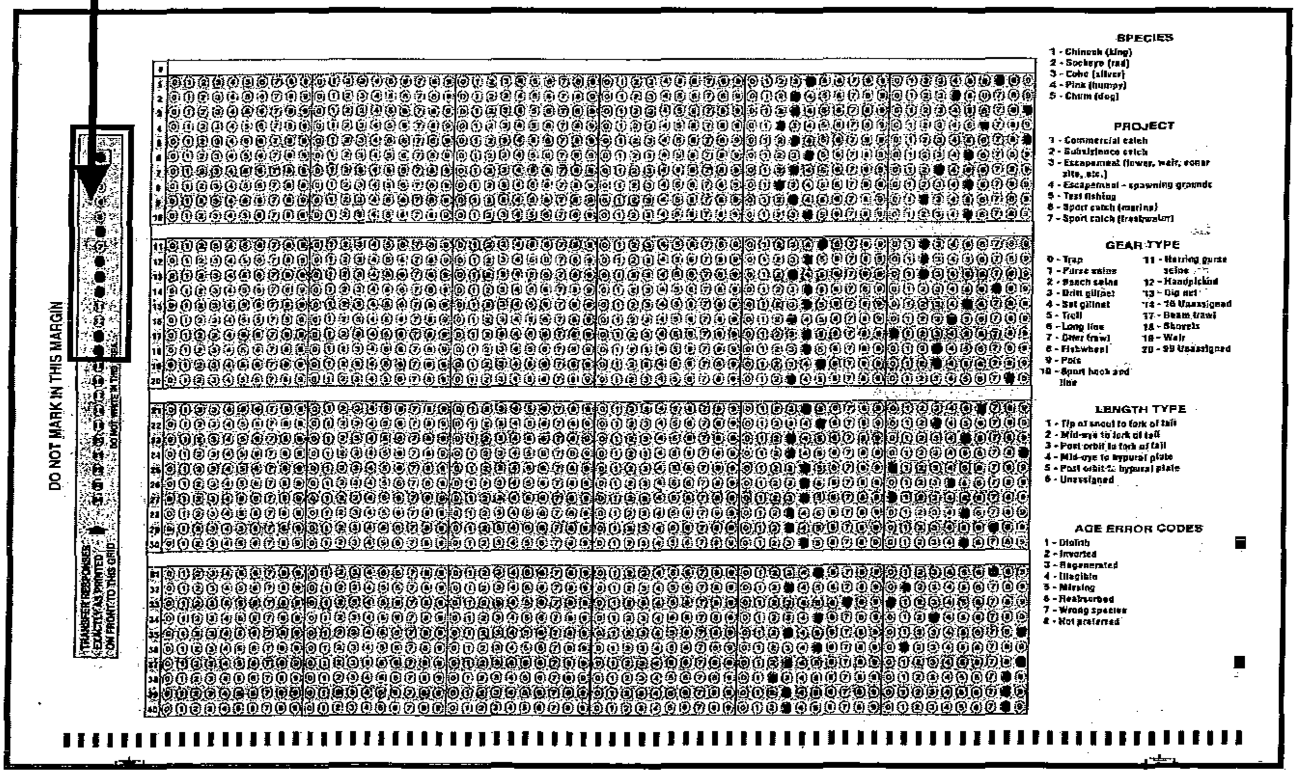
Take care to ensure length and weight data corresponds to the appropriate scale smear as this information is used to calculate condition factor at age. When sampling for age, length, and weight, rite-in-rain books may be used to record data. After sampling is done, transfer the data carefully to the AWL forms. Data should be transcribed to AWL forms daily to help prevent the introduction of error. **It is the responsibility of the crew leader to make sure the data has been transferred correctly and the AWL form is filled out completely. If forms are found to contain error during the opscanning process they will be returned to the crew leader for necessary editing.**

Appendix B.2 Example of a filled out AWL form for smolt.



Fill in litho codes.

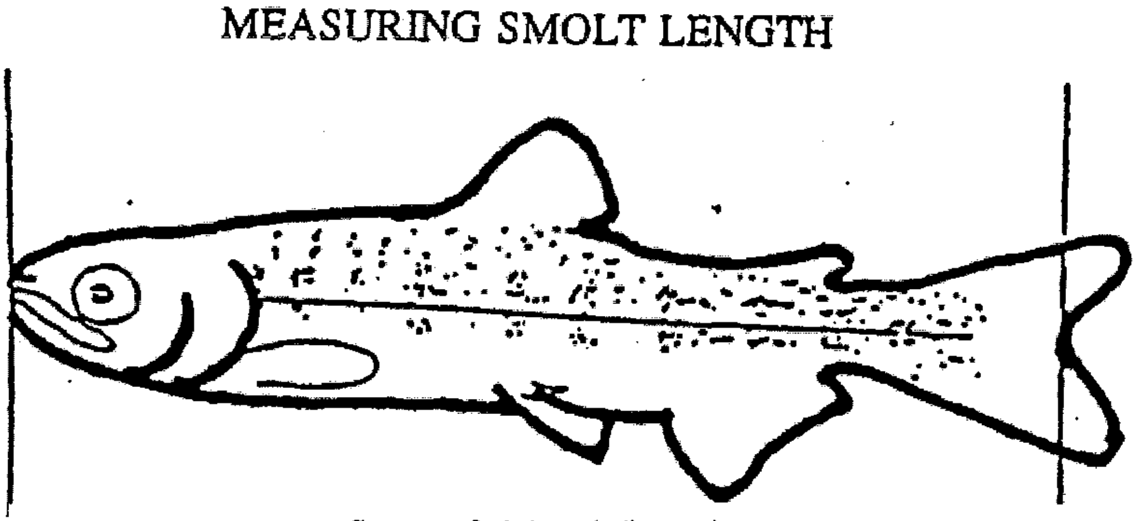
Backside of AWL



Appendix B.3. Statistical week (period) calendar.

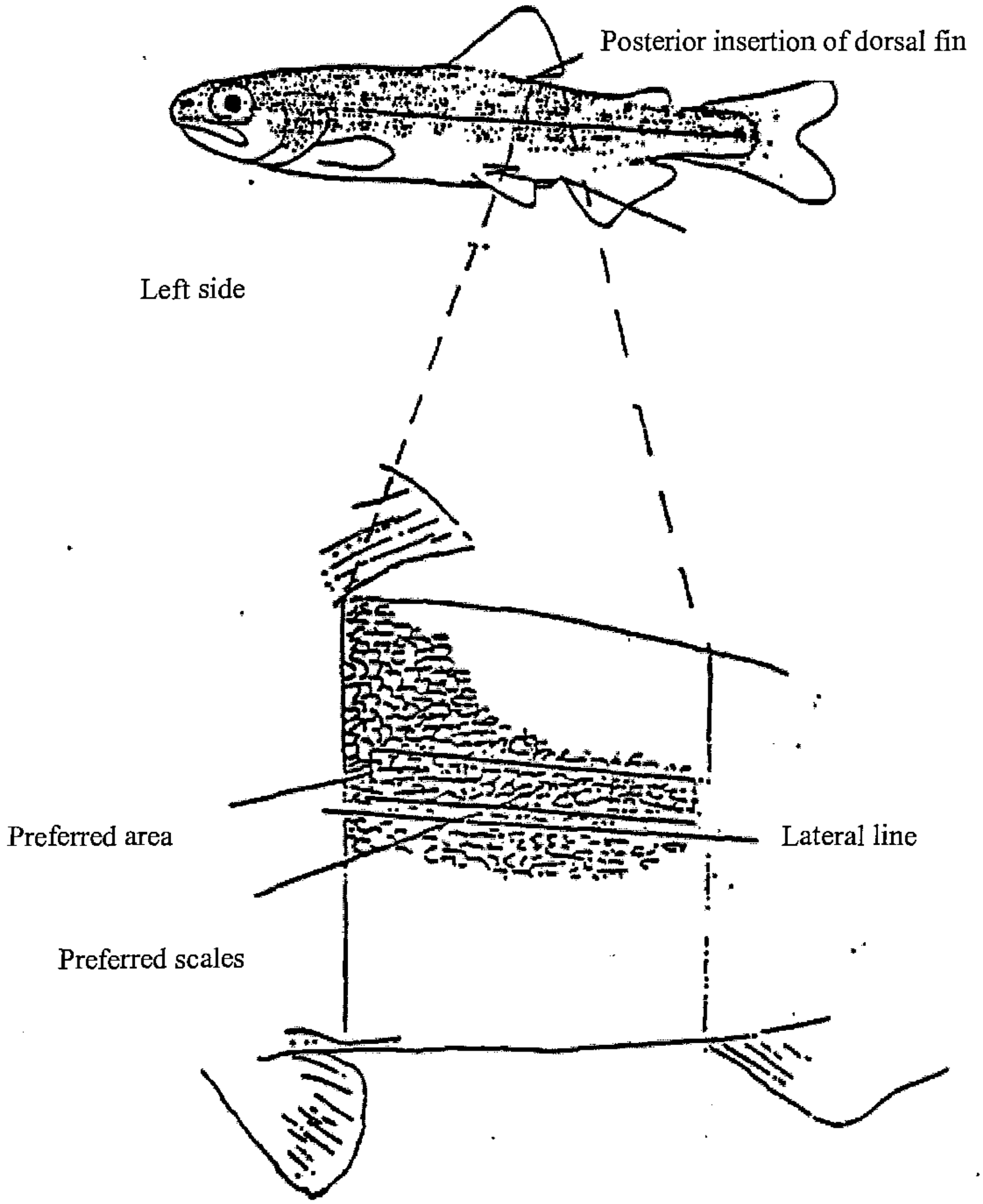
Week	Calendar Dates	Week	Calendar Dates
1	01-Jan to 03-Jan	28	05-Jul to 11-Jul
2	04-Jan to 10-Jan	29	12-Jul to 18-Jul
3	11-Jan to 17-Jan	30	19-Jul to 25-Jul
4	18-Jan to 24-Jan	31	26-Jul to 01-Aug
5	25-Jan to 31-Jan	32	02-Aug to 08-Aug
6	01-Feb to 07-Feb	33	09-Aug to 15-Aug
7	08-Feb to 14-Feb	34	16-Aug to 22-Aug
8	15-Feb to 21-Feb	35	23-Aug to 29-Aug
9	22-Feb to 28-Feb	36	30-Aug to 05-Sep
10	01-Mar to 07-Mar	37	06-Sep to 12-Sep
11	08-Mar to 14-Mar	38	13-Sep to 19-Sep
12	15-Mar to 21-Mar	39	20-Sep to 26-Sep
13	22-Mar to 28-Mar	40	27-Sep to 03-Oct
14	29-Mar to 04-Apr	41	04-Oct to 10-Oct
15	05-Apr to 11-Apr	42	11-Oct to 17-Oct
16	12-Apr to 18-Apr	43	18-Oct to 24-Oct
17	19-Apr to 25-Apr	44	25-Oct to 31-Oct
18	26-Apr to 02-May	45	01-Nov to 07-Nov
19	03-May to 09-May	46	08-Nov to 14-Nov
20	10-May to 16-May	47	15-Nov to 21-Nov
21	17-May to 23-May	48	22-Nov to 28-Nov
22	24-May to 30-May	49	29-Nov to 05-Dec
23	31-May to 06-Jun	50	06-Dec to 12-Dec
24	07-Jun to 13-Jun	51	13-Dec to 19-Dec
25	14-Jun to 20-Jun	52	20-Dec to 26-Dec
26	21-Jun to 27-Jun	53	27-Dec to 31-Dec
27	28-Jun to 04-Jul		

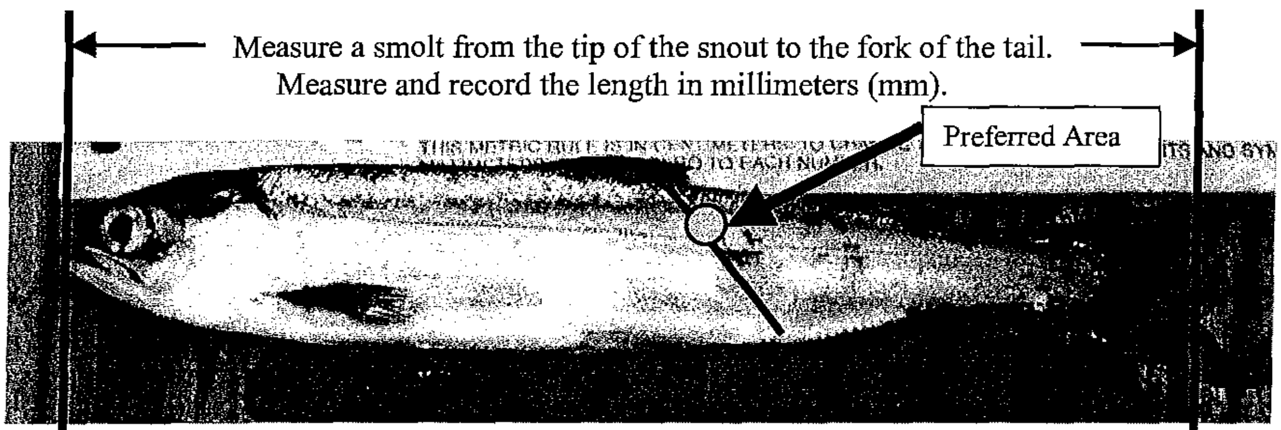
Appendix B.4. Example of measuring a salmon smolt.



Snout to fork length (in mm)

Appendix B.5.	Scale sampling procedure showing the preferred area on a salmon smolt.

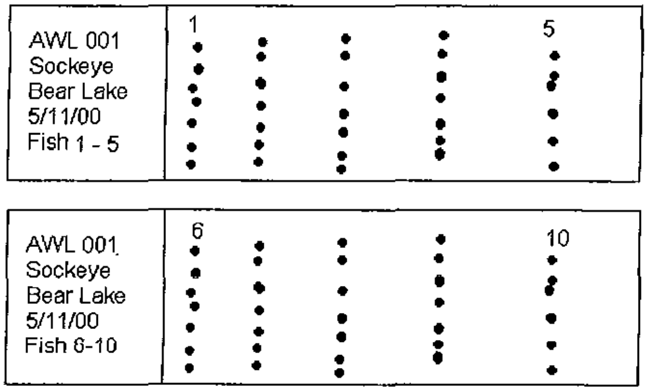




Appendix B.6. Salmon smolt slide example.

The following information should be legibly written on the slide label:

1. AWL #
2. Location
3. Date (mo/day/year)
4. Fish # (1-5, 6-10, etc.)



When the slides are completed, return them to the box in order by AWL# and fish #, and label: the slide box top with the following information:

1. Location
2. AWL Numbers
3. Beginning and ending dates

PERENOSA REHABILITATION AND ENHANCEMENT PROJECT OPERATIONAL PLAN, 2002

By
Robert Baer

Alaska Department of Fish and Game
Division of Commercial Fisheries
211 Mission Road
Kodiak, Alaska 99615

April 2002

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INTRODUCTION

The Perenosa Rehabilitation and Enhancement Project is comprised of three "sub-projects": sockeye salmon *Oncorhynchus nerka* rehabilitation at Pauls Lake, sockeye salmon rehabilitation at Portage Lake, and sockeye and pink salmon *O. gorbuscha* enhancement at Little Waterfall Creek (Figure 1). All of these lake systems are located on northern Afognak Island and drain into Perenosa Bay. The Pauls Lake system includes Pauls, Laura, and Gretchen Lakes and their inlet and outlet streams. This document will refer to the latter lakes and streams as Pauls Lake, except when lake or stream specific reference is required as part of the description of project operations.

Pauls Lake contained a natural run of sockeye salmon that was supplemented in the 1950s and 1960s through the planting of sockeye salmon eggs into the substrate at Gretchen Creek, and the construction of fish passes at barrier falls in Laura and Gretchen Creeks. The natural run and the introduction of other sockeye salmon stocks to this system have produced runs as high as 51,653 in 1980 (Honnold and Edmundson 1993). However, sockeye salmon runs to Pauls Lake declined after the mid 1980s to well below the biological escapement goal range (20,000 - 40,000), averaging approximately 12,000 fish from 1985-1992 (Wadle and Brennan 2001). Sockeye salmon escapement dropped to a low of only 3,200 fish in 1991.

The Alaska Department of Fish and Game (ADF&G) and the Kodiak Regional Aquaculture Association (KRAA) initiated a self sustaining sockeye salmon enhancement program in 1993 at Pauls Lake. Laura Lake was fertilized from 1993 through 1999 to increase the forage base available to rearing juvenile salmon. In addition, sockeye salmon fry were stocked into Laura Lake from 1994 - 1996, and in 1999 to supplement natural production. The desired escapement goals (20,000 - 40,000 fish) were achieved in 1996, 1997, 1999, 2000 and 2001; however, sockeye salmon escapements declined to approximately 15,000 fish in 1998. The restoration plan, specified that supplemental stocking would not occur if the desired escapement goal was achieved. Consequently, stocking did not occur in 1997, 1998, 2000 or 2001. Project activity in 2002 will include weir operation, smolt and adult escapement sampling, commercial and subsistence fishery monitoring, fish pass maintenance and construction, and peak spawner stream surveys.

The fish pass constructed in the 1960s bypasses a barrier falls in Portage Creek, allowing sockeye, pink, and coho salmon access to Portage Lake and associated spawning tributaries. The desired sockeye salmon escapement goal at Portage Lake is 5,000 – 10,000 fish (Brennan 1998). Prior to 1995, sockeye salmon escapements averaged less than 5,000 fish. The ADF&G and the KRAA initiated a sockeye salmon restoration program in 1993 at Portage Lake. Lake enrichment occurred from 1993 - 1997 to increase the zooplankton population in the lake and provide a healthy nursery area for rearing sockeye salmon fry. Portage Lake sockeye salmon escapements have been estimated annually by aerial or foot survey, except from 1987 through 1993 and in 2000 and 2001 when a weir was operated. Due to budget constraints, a weir will not be operated at the Portage system in 2002. In 2002, smolt sampling, commercial and subsistence fisheries monitoring, fish pass maintenance, construction of low water diversions, and peak spawner stream surveys will be conducted.

Fish passes were installed (in the 1970s and 1980s) at three barriers falls in Little Waterfall Creek to allow pink and coho salmon access to spawning areas. Pink salmon escapement has consequently increased from approximately 7,000 fish from 1968 through 1980 to an average of approximately 70,000 fish from 1981 through 1998. In 1992, the ADF&G and KRAA initiated a sockeye salmon enhancement project at Little Waterfall Lake (a barren lake). Sockeye salmon juveniles have been stocked annually into Little Waterfall Lake since 1992. Approximately 20,300 adult sockeye salmon are expected to return to Little Waterfall Bay in 2002 as a result of stocking. The lake has also been fertilized since 1993 to maintain a stable zooplankton population. Project activities at Little Waterfall Creek in 2002 will include smolt sampling, commercial fishery monitoring, catch sampling, fish pass maintenance, and stream surveys.

Goals

The primary goal of the Perenosa Bay field project is to monitor and evaluate sockeye salmon restoration (Pauls and Portage Lakes) and enhancement (Little Waterfall Lake) projects.

Objectives

1. Estimate the sockeye salmon harvest and effort in the commercial, sport, and subsistence fisheries within Perenosa Bay (sections 251-82, 251-83 and 251-84).
2. Estimate the age and length composition of sockeye salmon harvested in Perenosa Bay.
3. Estimate the age and size composition from a portion of the sockeye salmon smolt emigrating from Pauls, Portage, and Little Waterfall Lakes.
4. Estimate Pauls and Portage Lakes sockeye salmon escapement, and Pauls Lake sockeye salmon escapement age structure.
5. Provide for the optimum use of fish passes and access to spawning habitat at Pauls and Portage Lakes, and Little Waterfall Creek.
6. Summarize all project activities in a written report.

Project Biologist: Rob Baer (FB II)

Field Staff:

Crew leader- Tyler Swanson (FT IV) - 5/1-7/31

Crew - Joyce Soong (FT III) - 5/20-7/31

Tasks

1. Open up camp, install barrier at Little Waterfall Creek outlet.
   Target dates: 23 May - 26 May
2. Collect physical data daily - air and water temperature, stream water depth, and weather observations at trap and weir sites.

Target dates: 26 May – 31 July

3. Begin beach seine collection and AWL sampling of outmigrating sockeye smolt at Little Waterfall, Pauls, and Portage Creeks.
   Target dates: 25 May -15 June

4. Collect and sample (AWLs) a total of 200 sockeye salmon smolt from each of the Perenosa Bay lake systems (Little Waterfall, Pauls, and Portage Lakes) during a three-week period. Sampling should be spread out throughout the migration period (approximately 70 smolt/ week/ system).
   Target Dates: 22 May-15 June

5. Open up Pauls Bay camp, conduct a foot survey to estimate sockeye salmon upstream of weir site prior to weir installation and install Pauls Lake weir. Enumerate all salmon through the weir.
   Target dates: 01 June – 30 July

6. Conduct surveys to estimate adult sockeye salmon build up at Waterfall, Pauls, and Portage Estuary/Bays.
   Target Dates: 25 May - daily through end of runs

7. Estimate the daily sockeye salmon harvest and number of boats fishing in WBTHA (initial opening 09 June) and in the remainder of Perenosa Bay (if a fishery occurs that targets Pauls or Portage sockeye or coho salmon) including pink and coho salmon catches and sport and subsistence harvest if time permits.
   Target Dates: 09 June - 15 July (whenever a fishery is open)

8. Collect 600 scales total (150 per week) from sockeye salmon commercial harvest at Little Waterfall Bay.
   Target Dates: 09 June - 15 July (whenever a fishery is open)

9. Sample 600 (150 per week) adult sockeye salmon from Pauls Lake weir.
   Target Dates: 09 June – 30 July

10. Remove fish pass doors and conduct maintenance inventory.
    Target dates: Laura, Portage, and Gretchen - 15 June, or after smolt work is completed at Waterfall - 01 July (after sockeye salmon fishery is complete)

11. Replace fish pass covers and cables, and repair or construct diversion structures (if necessary) at Pauls, Gretchen, Portage, and Little Waterfall fish passes.
    Target Date: 01 July - 20 July

12. Remove and store Pauls weir and any previously installed water diversion boards.
    Target Date: 29 July

13. Inventory and secure Pauls Bay and Waterfall camps and close down for the season.
    Target Date: 30 July

14. Write Project Summary Report, specifically addressing objectives and make recommendations for changes/improvements in 2003.
    Target Date: 31 July

PROCEDURES

Barrier Net and Weir Installation and Maintenance

A barrier net, approximately 7.3 x 30.5 m long, will be anchored and secured at the most terminal area of Little Waterfall Bay (the bay is actually located between Big and Little Waterfall Bays, and drains Little Waterfall Lake) to prevent sockeye salmon escapement into Little Waterfall Creek. The net will be cleaned of kelp and other debris daily and inspected to insure that it is "fish tight". A buoyed line will be installed ~15 m in front of the net to serve as a no fishing zone.

The net will be positioned where the bottom contour is smooth and relatively free of debris. In addition, the net will be installed and suspended from a taught line and stretched between two solid anchors on either bank, high above the top of the net. The installation and placement of the net will be similar to past years. Due to tidal exchange, creek current, salmon pressure, and debris build-up, the barrier seine must be monitored, cleaned, and maintained daily. Precautions must be taken to keep the lead lines from lifting off the bottom. The webbing must be inspected for holes and 'leaks' and repaired as needed.

Sockeye Salmon Smolt Collection

Little Waterfall and Portage Lakes sockeye salmon smolt will be collected by beach seining in the most downstream areas of the outlet creeks and the intertidal/estuarine areas near the creek's terminus. However, a crew will be stationed at Portage Creek and may set up a fyke net in place of beach seining to catch salmon smolt in the creek. Pauls Lake smolt will be collected at the outlet creek or by seining either on the upstream side of the Pauls Lake weir or at the terminus of Pauls Creek. Seining and trapping will occur from the last week in May through the middle of June. Daily and seasonal collection efforts and catch by species will be recorded on the *Daily Smolt Catch Reporting* (Figures 2) and the *Sockeye Salmon Smolt Summary Forms* (Figures 3).

Smolt Identification, Enumeration, and Condition

Refer to the supplemental binder that contains identification keys if questions arise regarding species identification. The Project Biologist should be contacted if there are any questions regarding identification. Sockeye salmon smolt are easily stressed, so it is important to handle the smolt gently. Mortality can occur with the loss of just a few scales. Observations of excessive scale loss, lacerations, and/or mortality will be noted in the comments section on the *Daily Smolt Trap Catch Reporting Form* (Figure 2). Catch effort data and number sampled will be summarized on the *Sockeye Smolt Summary Form* (Figure 3).

Age, Weight, and Length Sampling

A minimum sample of 200 sockeye salmon smolt will be collected for age, weight, and length (AWL) samples from the outmigration. However, every attempt should be made to collect ~120 smolt samples per week throughout the migration period. If possible, samples should be taken from a single day's catch. A single sampling day is the 24-hour period from noon to noon and will be identified by the calendar date corresponding to the first noon.

Smolt that are collected will be kept alive and sampled the day of capture. Tricaine Methanesulfonate (MS-222) will be used to anesthetize the fish. Latex gloves should be worn to prevent direct exposure to MS-222 (review the Material Safety Data Sheet in the Kodiak office binder). The use of this chemical will be demonstrated in Kodiak. Further training by the Project Biologist will occur in the field, if necessary. The age, weight, and length data will be recorded on adult AWL forms (no smolt AWL forms exist). Refer to Appendix A.1-3 for an example on how to properly record data onto an AWL form. The personnel collecting the data will be recorded at the top of each AWL form. The new green AWL forms will be used for the 2002 field season; do not use blue or red AWL forms as they are out of date. **It is critical to fill out the AWL forms correctly.**

A scalpel will be used to remove 5-10 scales from the preferred area of each smolt. The preferred area is located on the left side of the fish, where an imaginary line is drawn from the posterior edge of the dorsal fin to the anterior portion of the anal fin, 2 to 3 rows up from the lateral line (Appendix A.4). The scales will be mounted on a glass slide (Appendix A.5). The left portion of each slide will be labeled with the AWL number, sample location, date, species, and fish number. **The smolt lengths will be measured from the tip of the snout to the fork of the tail to the nearest millimeter.** Smolt will be blotted with a moist paper towel prior to being weighed. **Individual smolt weights will be recorded to the nearest 0.1 gram.** After sampling, the smolt will be released into a bucket of fresh water to recover from the anaesthetic. The smolt will not be released until they are fully recovered from the MS-222. When mortality occurs during sampling, 5-10 smolt will be saved and preserved in a poly bottle containing a 15% solution of buffered formalin. The bottle will be labeled with system, date, and preservative.

All data (forms) will be forwarded to the area office for review on a frequent basis (weekly or on the earliest available plane to town). The data will be duplicated in case originals are misplaced in transit. **Please be conscientious in the quality control of <u>all</u> data prior to sending into Kodiak. Take the time to thoroughly review slides and forms to see that they are filled out properly. This is especially important for the computer AWL forms.**

These are some common mistakes:

1) Scales mounted poorly - avoid too many scales in a smear and avoid slime or debris when mounting; also, keep smears far enough apart to avoid mistaking one fish for another.

2) Numbering AWL forms improperly - for example, if 70 smolt are sampled in one day (day 1), the AWL numbers should be 001 (fish 1-40; 8 slides), 002 (1-30; 6 slides), do not continue from 40 to 41-70. The next day will start with AWL 003 (fish 1-40) and so on.

4) Damaged AWL form (computer - Mark sense) - do not bend, fold, tape, staple, paper clip, etc. these forms, otherwise the computer will not read them correctly.

5) AWL not completely filled out for smolt – be sure to transcribe the litho code on the back side of the form.

6) Filling bubbles on a stack of paper or AWL's - use a hard surface to fill out AWL forms, dimpling occurs if this is not done.

Pauls Bay Weir Installation, Operation, and Maintenance

The Pauls Bay weir will be installed by 01 June. The weir consists of two sections composed of drilled angle iron and aluminum conduit material (~20' total length). A large beam will be placed downstream of the weir and used as a catwalk. The beam will be installed first and cabled to the bank (floats during high water events). The longest weir section will be installed upstream of the beam between a large exposed rock and shore. The shorter section of weir will be installed similarly on the opposite side of the rock. The drilled angle iron will be supported by sandbags and placed at a slight downstream angle to the beam. Sandbags will also be used between, and on top of the angle iron to secure the pieces once they are positioned properly. The conduit pipes will be fitted into the holes of both the upper and lower angle iron. The angle iron may need adjusting so that the pieces of conduit slip into place easily. A rope will be secured from bank to bank to prevent the weir from being pushed into the lake during high tides. The weir will be cleaned of debris daily and will also be inspected frequently each day for "holes."

Pauls Bay Weir Escapement Counts

Fish will be passed through the weir and enumerated by species using a tally whacker to ensure accurate counts. Daily and cumulative counts will be recorded on the *Kodiak Management Area Weekly Salmon Weir Counts Reporting form* (Figure 4). The escapement enumeration day begins at 0000 hour (midnight) and ends the following 0000 hour. The previous days count will be relayed to the Kodiak ADF&G Management staff during the 0800 hour radio schedule.

Fishery Monitoring and Escapement Sampling

Fishery monitoring during subsistence, sport, and commercial fishing periods will include boat surveys to assess run strength of sockeye, pink, and coho salmon at Little Waterfall, Portage (Discover Bay), and Pauls Bay. The vessel names, fishing location, and estimated catch by species will be recorded on the *Terminal Harvest Area (Waterfall Bay) Monitoring Reporting* form (Figure 5).

The sockeye harvest from WBTHA will be sampled throughout the fishery. A minimum of 600 sockeye (150 per week) will be sampled for age, sex, and length. In addition, a sample of 600 adult sockeye will be collected from Pauls Lake. Age (scales), sex, and length data will be collected throughout the season. Sample data will be recorded on the *Sockeye Salmon Adult Sampling*

Summary Form (Figure 6). Refer to Appendices A.6-A.10 for procedures on properly filling out AWL forms and sampling adult salmon.

Bay and Stream Surveys

Surveys will be conducted as needed at Little Waterfall, Pauls, and Portage Bays/Estuaries and streams to track any sockeye salmon build up. All sockeye salmon returns will be available for harvest in the WBTHA.

Physical Data

Physical data will be collected daily at the weirs and smolt capture sites. The information will be recorded on the *Daily Physical Observation Form* (Figure 7) and will include, water and air temperatures, stream depth, percent cloud cover, wind direction and velocity, and precipitation. A stream gauge will be placed at each site for measuring stream depth.

Fish Pass Door Removal, Inventory, and Maintenance

The plywood doors on the upstream ends of the fish passes will be removed and stored on site (Note: Store the fishpass doors in a place where they can be located at the end of the season). This task will be conducted after the sockeye salmon smolt outmigration is complete to prevent injury to smolt as a result of passage through the fish passes. An inventory of fish pass condition and needed repairs will be conducted at this time. Any damaged plywood fish pass covers will be replaced with aluminum covers. Cross braces will be tightened and replaced if damaged. Cables that secure the fish pass sections in place will be tightened and replaced if necessary. Any debris that could block fish passage will be removed from the fish passes. This can be accomplished prior to door removal when flow through the fish pass is minimal. Remove any gravel and debris that has accumulated upstream of the fish passes. At the most upstream fish pass at Waterfall, **a safety railing will be secured prior to any work.**

Diversion Board, Weir Installation and Maintenance

At low water periods, fish pass diversion boards will be installed at Portage Creek, the two downstream fish passes at Little Waterfall, and at Gretchen Creek. These boards will be placed upstream to divert more water into the fish passes. Boards (2 x 12's) will be attached a to pipe that is presently secured in the stream substrate. Sandbags and visqueen or lortex material will be used as needed to increase the flow into the fish pass. It would be advantageous, if time permits, to install the pipe in the creek bottom in the same manner as previously accomplished at Gretchen Creek to enable attachment of 2" x 12"s. This installation will require using a rock drill for placement of the pipe and also attachment of 'U' bolts to new 2" x 12" boards. These boards will then be secured by the 'U' bolts to the pipe. The diversion boards/pipe will be left in place during high water periods at all three creeks but will be removed at the end of the season.

Weir and Diversion Structure Removal and Storage

Upon completion of project objectives, all weirs and diversion structures will be removed and stored on site in secure areas. At Gretchen and Waterfall Creeks, these items should be secured to the stream banks, since high flows are common during the winter months.

Project Summary Report

The crew leader will be responsible for providing a Project Summary Report to the Project Biologist prior to transfer to LWOP status. A draft version will be submitted for review at least a week in advance of the end of the season. The report will be written according to the attached format (Appendix B). Sections of the report can be delegated to crewmembers; however, the crew leader is ultimately responsible for report content. This report will include the following: 1) summary of all data associated with the project; 2) summary of all operations and activities (including dates) of the project; 3) a thorough field analysis of the project, based on the current objectives, with recommendations for modifications and/or improvements for the 2002 season; and 4) inventory for each project site and a "needs list" for 2002. Please review the Little Waterfall, Portage and Laura lakes' pre-fertilization reports for the type of information that will be helpful.

OTHER REQUIREMENTS

Safety and Radio Schedule

Safety is the highest priority of this project. State safety regulations and Standard Operating Procedures (SOPs) must be followed at all times. On-site personnel will exercise extreme caution when considering safety issues. Employees not following State safety regulations may be subject to disciplinary action, including termination, without warning.

Employees are expected to review and sign the following SOPs before beginning work:

111-700	Safety Policies and Standards;
111-710	Office/Warehouse Safety;
111-720	Field Camp Safety;
111-730	Aircraft Safety for Passengers;
111-740	Boating Safety;
111-750	Vehicle Safety;
111-760	Laboratory Safety;
111-780	Firearm/Bear Safety.

In addition, all employees are expected to hold a current American Red Cross First Aid/CPR certification. The Department will hold First Aid/CPR classes in Kodiak prior to the field season: if the employee is unable to attend the classes in Kodiak, obtaining the proper instruction will be the employee's responsibility.

An approved personal flotation device will be worn at all times while boating. A survival kit including matches, VHF radio, flare gun, GPS unit, spare motor parts, and a first aid kit will be in the boat at all times.

Ultimately, each employee is responsible for his/her own safety.

Field camps will be contacted daily by Kodiak office personnel on the single side band radio (SSB). The frequency for Fish and Game contact is 3230 kHz. The morning radio schedule with the Kodiak Area Management Biologist will be from 0800 - 0830 hours seven days a week, and the afternoon radio schedule with the Project Biologist will be from 1300 – 1315 hours Monday through Friday and on Sunday evening from 2000 - 2015 hours. If contact is necessary at other times, information can be relayed at 0800 and 2000 hours seven days a week to Kodiak office personnel via SSB 3230 during normal working hours, 0800 – 1700, Monday through Friday. Emergency contact should be attempted with ADF&G office staff. If there is a medical emergency after hours or office personnel cannot be contacted, contact the US Coast Guard on SSB 4125 or VHF channel 16. **ALL FIELD PERSONNEL WILL BE AWARE OF EMERGENCY CONTACT PROCEDURE POSTED ON EACH RADIO AND THE LONGITUDE AND LATITUDE COORDINATES WHERE THEIR CAMP IS LOCATED.**

Air Charters

All air charters will be set up through Kodiak staff. Logistical information will be relayed through daily radio contact. It is important to contact office personnel when any data, equipment, or other freight is "back hauled" to Kodiak. It is also important to clearly label "back hauled". Items; ADF&G Attn Rob Baer 486-1835.

Reporting

Crew leaders will be responsible for reporting all job activities and compiling biological data. Be sure to use pencil rather than a pen for all data entry. Data forms and a field log will be completed daily. Use "rite-in-the-rain" field log books in the field and transfer data onto standard data forms after fieldwork is completed. Data will be reported to Kodiak staff via radio and completed data forms will be sent to Kodiak weekly. Data sent to Kodiak should be properly packaged and labeled.

A report of project activities will be sent to town weekly or on the next available plane. A one page weekly report is sufficient (Appendix C).

Equipment Storage and Inventory

The crew leader is responsible for the proper maintenance, storage, and inventory of all project equipment. Appendix D describes the protocol to follow regarding equipment tracking, and storage. When the project is completed, the crew leader will inventory all project equipment, including the location of each stored item (i.e. at Waterfall, warehouse bin, etc.). Secure cabins and out buildings prior to leaving field sites.

Video/Photo Documentation

The crew leader will be responsible for photo documenting project activities. Specific aspects such as trap installations, weir construction, and other detailed tasks are important to photograph. When possible, State cameras and film will be used. If State cameras are not available, film will be provided for use with personal cameras. The use of personal cameras is suggested in this case, but not required.

Performance Appraisal

The crew leader will provide an evaluation of each crewmember's performance during the Perenosa Project operations. The performance evaluation will be written for each crewmember using the State of Alaska Performance Evaluation form as an outline. The individual that writes the evaluation will be referred to in the final evaluation written by the Project Biologist. The crew leader should keep crewmembers appraised of their performance during the project.

Timesheets

All timesheets are to be in the Kodiak office by the 15th and 30th of each month. When the employee is working in the field and receives hazard pay, the timesheet "Comments" column is to have the location of the field camp. A brief description into properly filling out a timesheet and an example of properly filled out timesheet can be seen in Appendix E.1-E.2. Work activities should be scheduled to be completed in a 7.5 hour day. There are times in the field (high water events, etc.) when personnel need to work beyond the normal work-day to ensure project objectives are being met. However, an attempt should be made to contact the project biologist to discuss the need to work additional overtime.

LITERATURE CITED

Brennan, K. 1998. Kodiak Management Area Commercial Salmon Annual Management Report, 1996. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, RIR No. 4K98-35, Kodiak.

Honnold, S.G. and J.A. Edmundson. 1993. Limnological and fisheries assessment of sockeye salmon (Oncorhynchus nerka) production in the Laura Lake system. Alaska Dept. of Fish and Game, Fisheries Enhancement, Rehabilitation, and Development Division, FRED Report No. 130, Juneau.

Wadle, J.A. and K. Brennan. 2001. Kodiak Area Commercial Salmon Annual Management Report, 1999. Alaska Department of Fish and Game, Division of Commercial Fisheries, RIR No. 4K01-5, Kodiak.

Wadle, J.A. and S.G. Honnold. 2000. An Assessment of the Straying of Two Enhanced Sockeye Salmon Stocks on Northern Afognak Island, As Influenced by Artificial Barriers Preventing Access to Freshwater. Alaska Department of Fish and Game, Division of Commercial Fisheries, RIR No. 4K00-53, Kodiak.

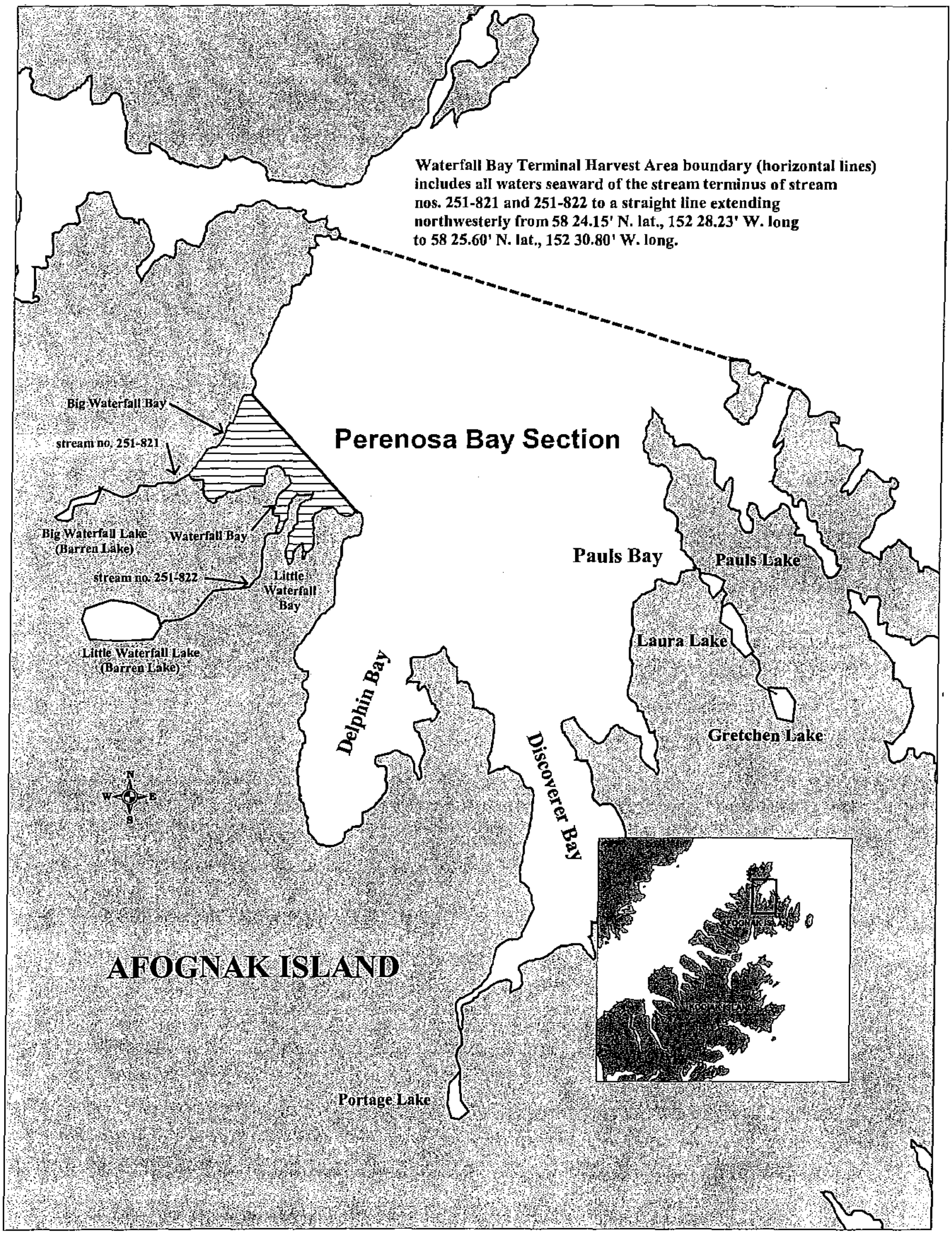


Figure 1. Perenosa Bay area enhancement and rehabilitation systems evaluated by the Alaska Department of Fish and Game

DAILY SMOLT CATCH REPORTING FORM

page_____of_____

PROJECT/
SUB-PROJECT: __________ DATE ____________________ TRAP/SEINING LOCATION: ______________________________

TIME (military)	SOCKEYE SMOLT (numbers)			OTHER (numbers)						COMMENTS[1]
	CATCH	TRAP/SEINE MORTALITY	LIVEBOX MORTALITY	COHO	PINK	DOLLY V.	STICKLEB.	RAINBOW	OTHER	
TOTAL										

[1] To be included in comments: significant water level changes, problems, observations.

Figure 2. Daily smolt catch reporting form.

SOCKEYE SALMON SMOLT SUMMARY FORM

PROJECT/
SUB-PROJECT: ____________ YEAR: __________ page_____of_____

____

	NUMBER OF SMOLT					
	CATCH			SAMPLED		
DATE[1]	DAILY	CUMULATIVE	MORTS[2]	DAILY	CUM	COMMENTS:

[1] Each date covers a 24-hour period extending from noon to noon and identifies the starting date.

[2] Includes both trap/seining and livebox mortality.

Figure 3. Sockeye salmon smolt summary form.

ALASKA DEPARTMENT OF FISH AND GAME
KODIAK MANAGEMENT AREA
WEEKLY SALMON WEIR COUNT REPORT FOR YEAR:

WEIR CAMP
NAME:__________ PERSONNEL:______________ PAGE:_____ OF _____ WEEKLY REPORT FOR WEEK ENDING (SATURDAY) __________

DATE		DAILY TOTAL ESCAPEMENT							STEELHEAD	REDS	JACK	JACK	GILLNET	INJURED	H_2O LEVEL		H_2O	WEATHER		
		REDS	L. REDS	KINGS	PINKS	COHOS	CHUMS	DOLLY V.	DOWN	SAMPLED	NO.	%	REDS	REDS	UP	DOWN	TEMP	CEIL.	VIS.	WIND DIR/SPD.
SUN	D																			
	A																			
MON	D																			
	A																			
TUE	D																			
	A																			
WED	D																			
	A																			
THU	D																			
	A																			
FRI	D																			
	A																			
SAT	D																			
	A																			
WEEK TOTAL															COMMENTS:					
															COMMENTS:					
AWL WEEK															COMMENTS:					
AWL ACCUM														COMMENTS:						

ADDTITIONAL COMMENTS: BEAR AND PEOPLE PROBLEMS; SMOLT MIGRATION; WEIR PROBLEMS; CABIN REPAIR; NOTE AIRCRAFT TRAFFIC

Figure 4. Kodiak Management Area weekly salmon weir count reporting form.

Terminal Harvest Area (Waterfall Bay) Fishery Monitoring Reporting Form.										
		Estimated Harvest								
	Number	Sockeye		Pinks		Other		Sockeye Sampled		
Date	of Boats	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative	Comments
9-Jun										
10-Jun										
11-Jun										
12-Jun										
13-Jun										
14-Jun										
15-Jun										
16-Jun										
17-Jun										
18-Jun										
19-Jun										
20-Jun										
21-Jun										
22-Jun										
23-Jun										
24-Jun										
25-Jun										
26-Jun										
27-Jun										
28-Jun										
29-Jun										
30-Jun										
1-Jul										
2-Jul										
3-Jul										
TOTALS										

Figure 5. Waterfall Bay terminal harvest area fishery monitoring reporting form.

SOCKEYE SALMON ADULT SAMPLING SUMMARY FORM

PROJECT/
SUB-PROJECT: ________ YEAR: ________

page_____of_____

	NUMBER OF ADULTS					
	CATCH			SAMPLED		
DATE[1]	DAILY	CUMULATIVE	MORTS[2]	DAILY	CUM	COMMENTS:

[1] Each date covers a 24-hour period extending from midnight to midnight and identifies the starting date.

[2] Includes both trap/seining and livebox mortality.

Figure 6. Sockeye salmon adult sampling summary form.

DAILY PHYSICAL OBSERVATIONS

PROJECT/ SUB-PROJECT: ______________

YEAR ______________ page_____of_____

DATE	TIME	SITE[1]	TEMPERATURE (C)		CLOUD COVER		VISIBILITY	WIND		GAUGE	COMMENTS (i.e., rain, drizzle, etc...)
			Air	Water	Percent (%)	Ceiling	(mile)	Direction	Vel. (mph)	HEIGHT (cm)	

[1] Weir Site = W; Smolt Site = S

Figure 7. Daily physical observation form.

APPENDIX

Appendix A.1. Procedure for sampling salmon smolt for age-weight-length data.

AWL Forms

Smolt length and weight will be recorded on AWL forms (Appendix A.2). Using a no. 2 pencil, complete each section of the left side of the AWL and darken the corresponding blocks:

Description: Include species (sockeye smolt), location, year, and samplers.

Card: The AWL forms and corresponding slides are numbered sequentially by date throughout the season starting with #001. A new, consecutively numbered form is used each day even if the previous card is not completed. There may be a minimum of one fish and a maximum of 40 fish (8 slides) per AWL form.

Species: Refer to the reverse side of the AWL form to obtain species: sockeye = 2.

Day, Month, Year: Use the appropriate digits for the date fish are sampled.

	District, Subdistrict, Stream:		
Pauls	251	83	831
Portage	251	82	825
Little Waterfall	251	84	822

Period: List the period in which the fish were sampled (refer to Appendix A.3).

Project: Refer to the reverse side of the AWL form to obtain a code; code 8 will be used for smolt.

Gear: Refer to the reverse side of the AWL form to obtain a code; 00 = trap.

Mesh: Leave blank.

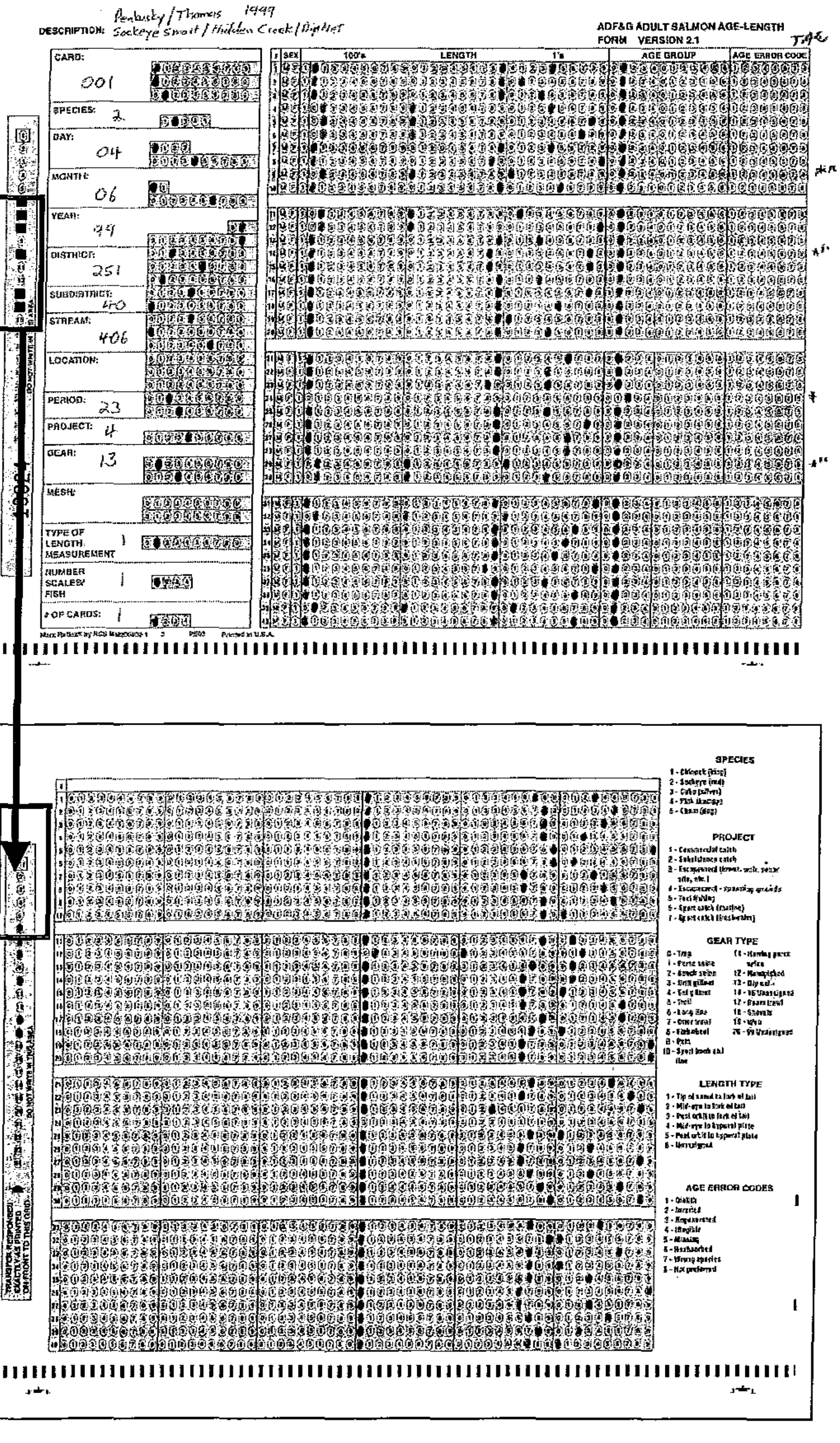
Type of Length Measurement: Refer to the reverse side of the AWL form to obtain a code; Tip of snout to fork of tail = 1 (Appendix A.4).

Number of Scales: Put a number 1 (refers to the column of scales per fish, which is one).

# of Cards: Put a number 1. **Keep litho codes in numerical order throughout the season** and be sure to transfer the litho code from the front left side to the backside of the AWL form when sampling smolt. These forms will be optically scanned and stray marks may be misinterpreted.

The crew leader is responsible for carefully editing all forms before returning them to your supervisor.

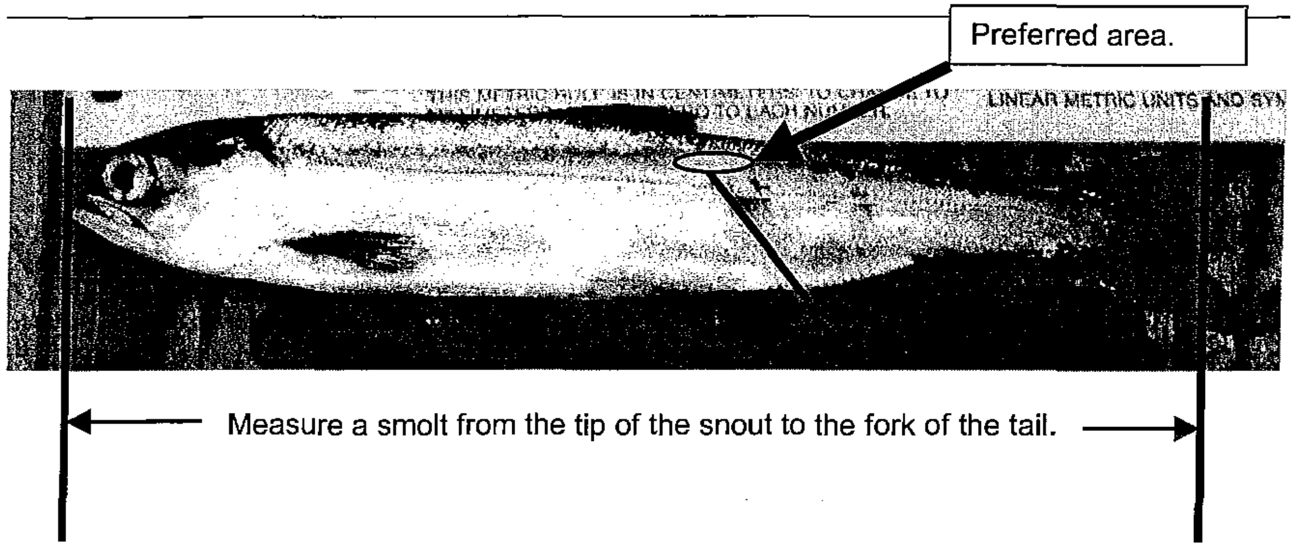
Appendix A.2. Example of an AWL form filled out for smolt sampled. (Note that the project code for smolt will be 8 for the 2002 season).



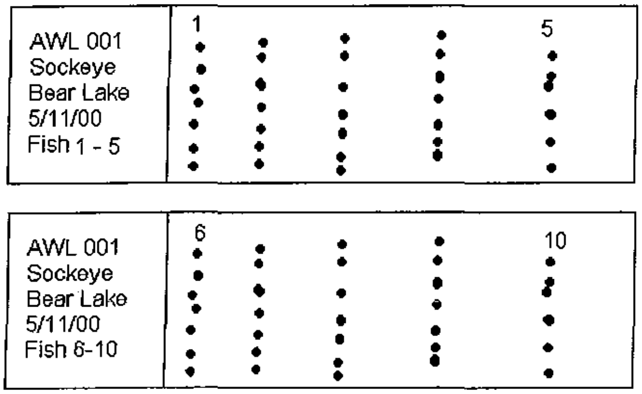
Appendix A.3. Period codes and sampling dates for the period section on AWL forms.

Period	Dates	Period	Dates
1	01-Jan to 03-Jan	28	05-July to 11-July
2	04-Jan to 10-Jan	29	12-July to 18-July
3	11-Jan to 17-Jan	30	19-July to 25-July
4	18-Jan to 24-Jan	31	26-July to 01-Aug
5	25-Jan to 31-Jan	32	02-Aug to 08-Aug
6	01-Feb to 07-Feb	33	09-Aug to 15-Aug
7	08-Feb to 14-Feb	34	16-Aug to 22-Aug
8	15-Feb to 21-Feb	35	23-Aug to 29-Aug
9	22-Feb to 28-Feb	36	30-Aug to 05-Sep
10	01-Mar to 07-Mar	37	06-Sep to 12-Sep
11	08-Mar to 14-Mar	38	13-Sep to 19-Sep
12	15-Mar to 21-Mar	39	20-Sep to 26-Sep
13	22-Mar to 28-Mar	40	27-Sep to 03-Oct
14	29-Mar to 4-Apr	41	04-Oct to 10-Oct
15	05-Apr to 11-Apr	42	11-Oct to 17-Oct
16	12-Apr to 18-Apr	43	18-Oct to 24-Oct
17	19-Apr to 25-Apr	44	25-Oct to 31-Oct
18	26-Apr to 02-May	45	01-Nov to 07-Nov
19	03-May to 09-May	46	08-Nov to 14-Nov
20	10-May to 16-May	47	15-Nov to 21-Nov
21	17-May to 23-may	48	22-Nov to 28-Nov
22	24-May to 30-May	49	29-Nov to 05-Dec
23	31-May 10 06 June	50	06-Dec to 12-Dec
24	07-June to 13-June	51	13-Dec to 19-Dec
25	14-June to 20-June	52	20-Dec to 26-Dec
26	21-June to 27-June	53	27-Dec to 31-Dec
27	28-June to 04-July		

Appendix A.4. Photo of a smolt with the preferred area highlighted.



Appendix A.5. An example of correctly labeled smolt AWL slides.



When the slides are completed, return them to the box in order by AWL # and fish #, and label the slide box on top with the following information:

Location: Bear Lake
AWL Number: AWL 001-003
Beginning and end dates: 6/12-7/13/00

Appendix A.6. Procedure for sampling salmon adults for age-sex-length data.

AWL Forms

Adult sex and length will be recorded on AWL forms (Appendix A.7). Using a no. 2 pencil, complete each section of the left side of the AWL and darken the corresponding blocks:

Description: Include species (adult sockeye), location, year, method of capture (purse seine, weir) and samplers.

Card: The AWL forms and gum cards are numbered sequentially by date throughout the season starting with #001. A new, consecutively numbered form is used each day even if the previous card is not completed. There may be a minimum of one fish and a maximum of 40 fish per AWL form.

Species: Refer to the reverse side of the AWL form to obtain species: sockeye = 2.

Day, Month, Year: Use the appropriate digits for the date fish are sampled.

	District, Subdistrict, Stream			
Pauls	251	83	831	(adult weir)
Portage	251	82	825	(adult weir)
Little Waterfall	251	84	822	(adult commercial catch)

Period: List the period in which the fish were sampled (refer to Appendix A.3).

Project: Refer to the reverse side of the AWL form to obtain a code (commercial catch = 1 or escapement = 3).

Gear: Refer to the reverse side of the AWL form to obtain a code; 01 = purse seine or 19 = weir.

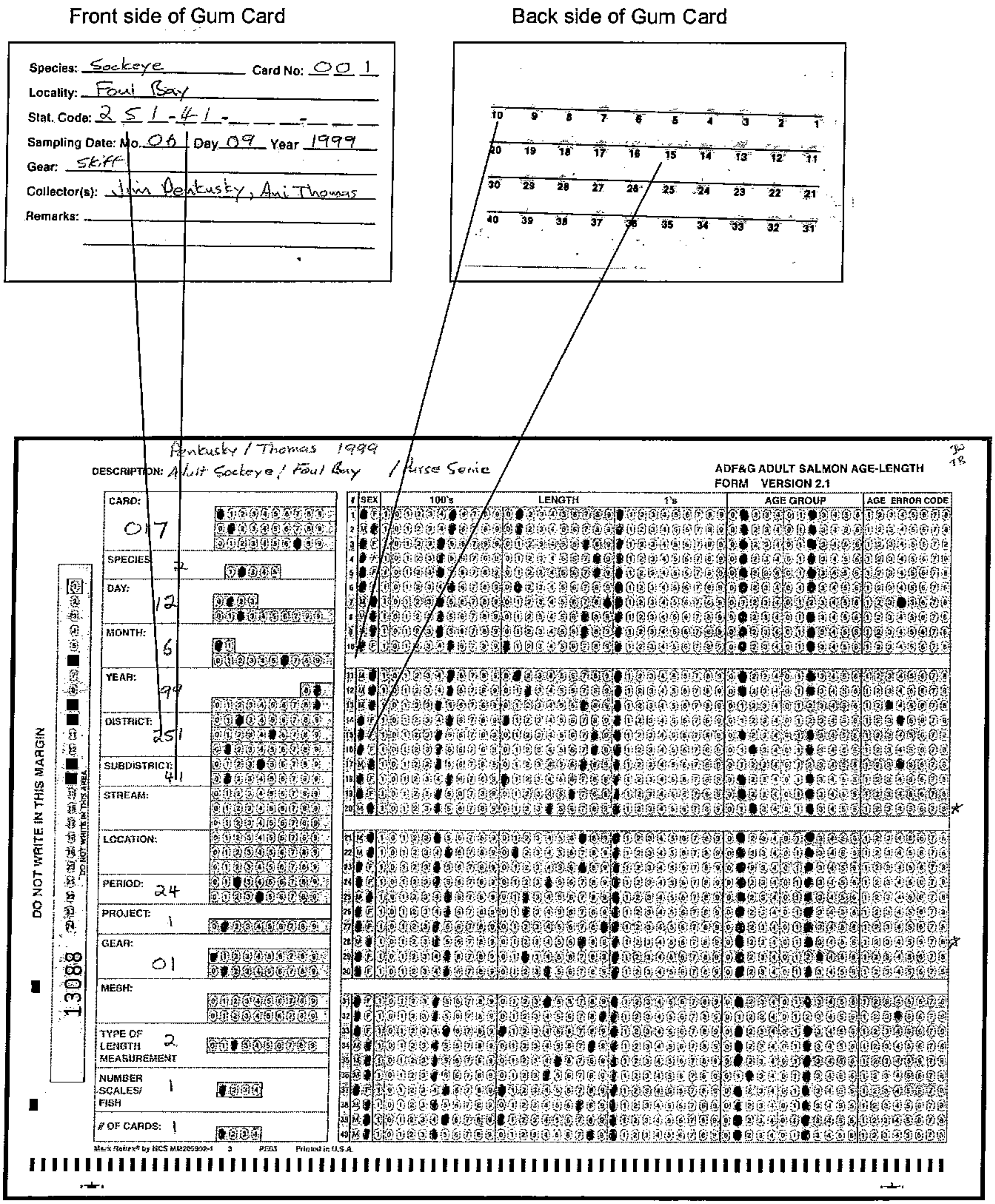
Mesh: Leave blank.

Type of Length Measurement: Refer to the reverse side of the AWL form to obtain a code (2 = mid-eye to fork of tail). Measure the fish from mid-eye to the fork of the tail (Appendix A.8).

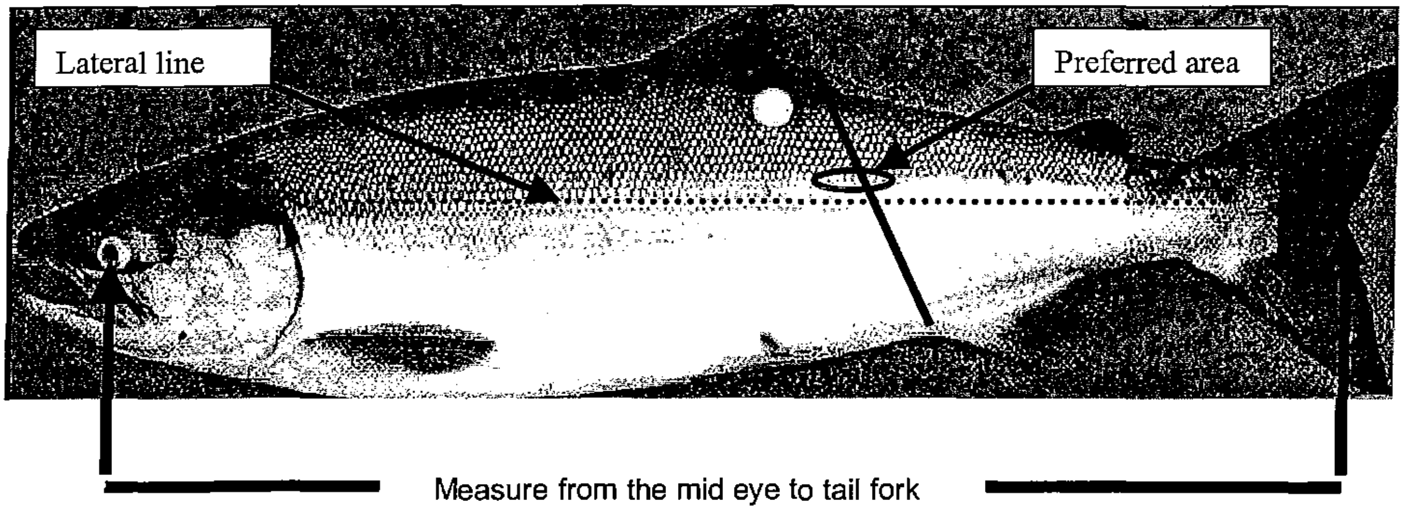
Number of Scales: Put a number 1 (refers to the column of scales per fish, which is one).

# of Cards: Put a number 1. Keep litho codes in numerical order throughout the season. These forms will be optically scanned and stray marks may be misinterpreted. It is the crew leaders responsibility to make sure that all forms are carefully edited before returning them to your supervisor.

Appendix A.7. Example of an AWL form and gum card filled out for adults.



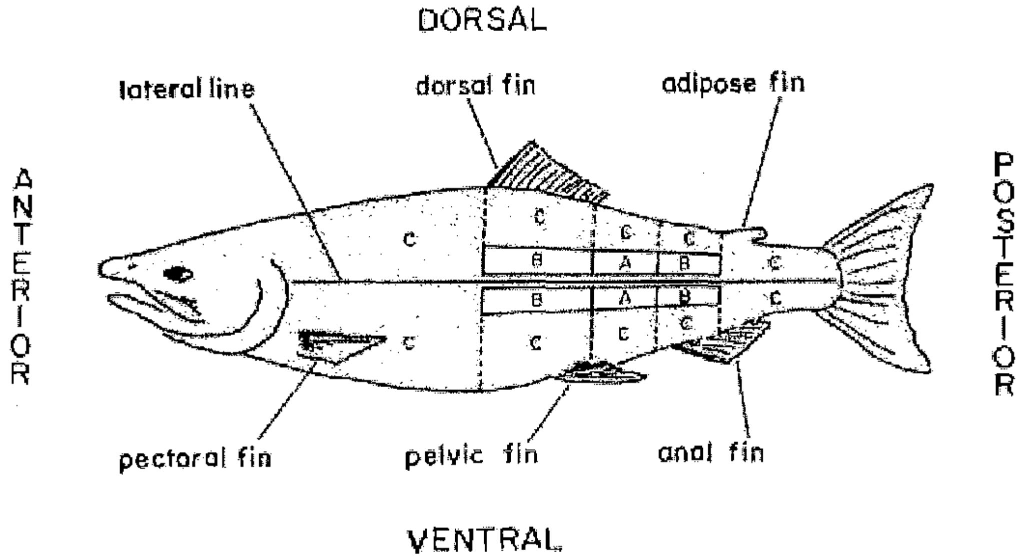
Appendix A 8. Measuring fish length from mid eye to tail fork.



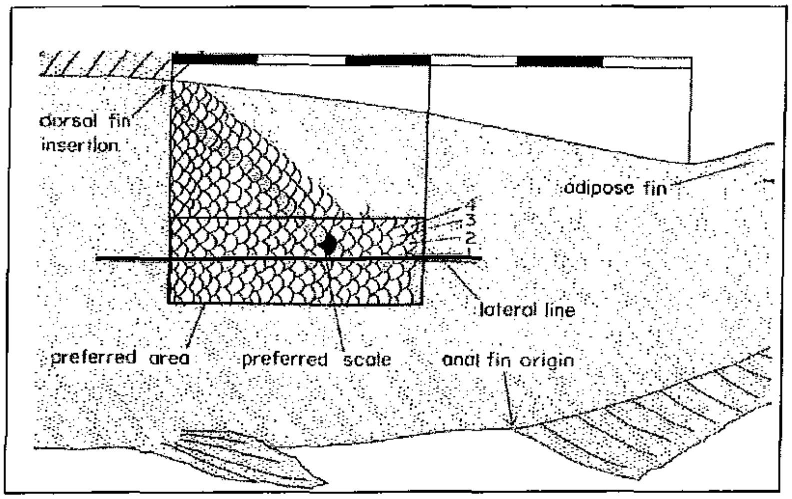
Mid eye to tail fork lengths are taken because the shape of the salmon's snout changes as it approaches sexual maturity. The procedure for measuring by this method is as follows.

1) Place the salmon flat on its right side (on the measuring board) with its head to your left and the dorsal fin away from you.
2) Slide the fish in place so that the middle of the eye is in line with the edge of the meter stick and hold the head in place with your left hand.
3) Flatten and spread the tail against the board with your right hand.
4) Read and record the mid eye to tail fork length to the nearest millimeter.

Appendix A.9. Removal and mounting of the preferred scale.

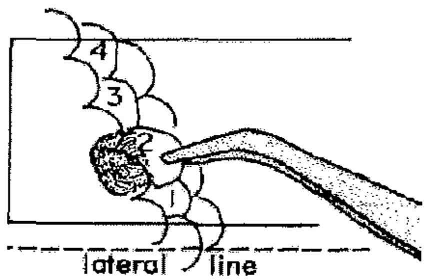


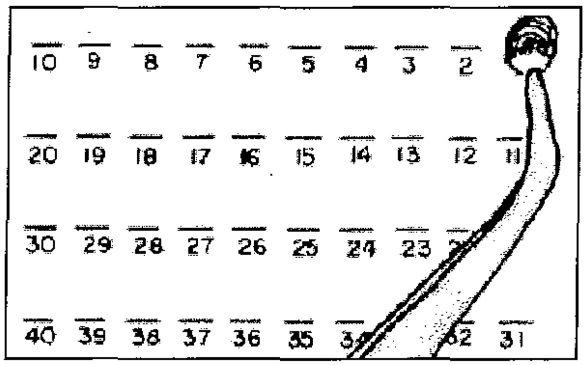
INPFC rated areas for scale removal. Area A is the preferred area. Area B is the second choice if there are no scales in area A. Area C designates non preferred areas. If scales on the left side are missing, try the right side.



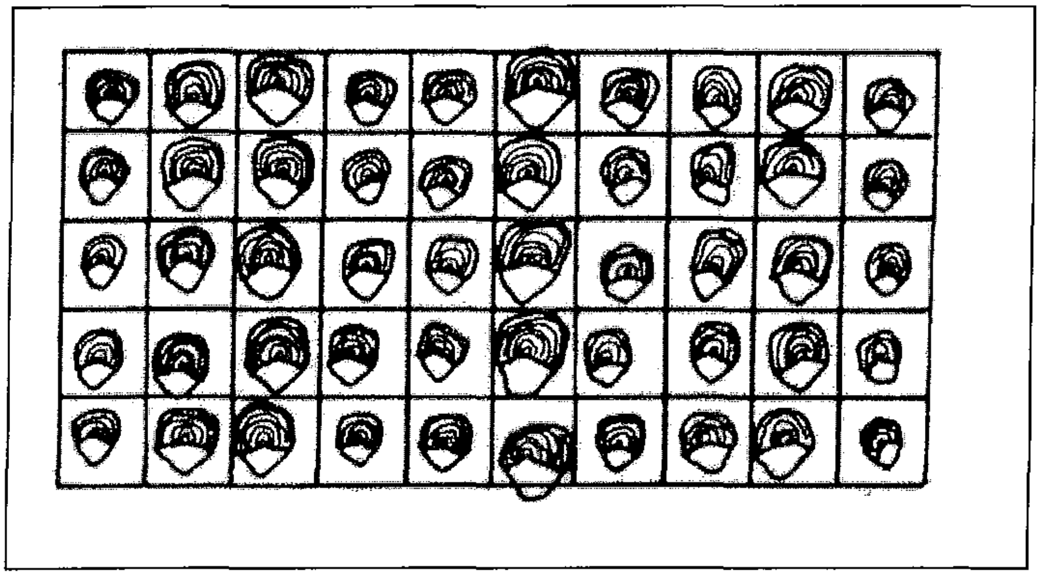
The preferred scale in this diagram is solid black. It is located 2 rows up from the lateral line, on a diagonal from the insertion (posterior) of the dorsal fin "back" toward the origin of the anal fin.

Do not turn scale over.

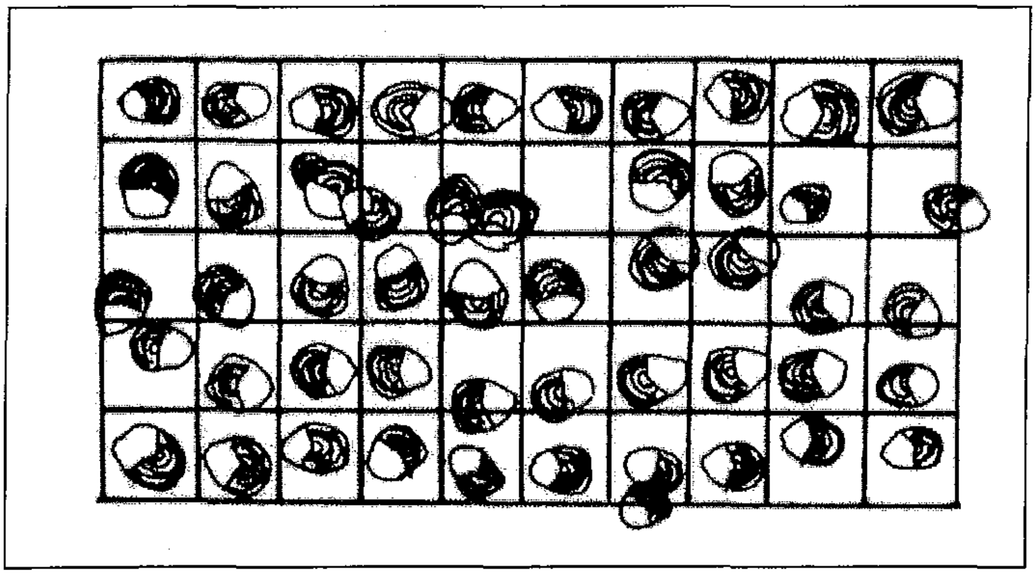




Appendix A.10. Scale orientation on the gummed card.



The scales are all correctly oriented on the card in the same direction, with the anterior portion of the scale pointed toward the top of the card.



The scales are incorrectly oriented in different directions. This increases the time spent to age samples.

Appendix B. Project report format.

I. INTRODUCTION

Description of project location.

Include a general and specific description of the location. For example, "located on the northeast portion of Afognak Island" and " Pauls creek is long by wide with average depth of...."

History of project

Give a brief history of the project (see Introduction of this plan and regional reports for examples)

Purpose of project.

Objectives

Purpose of report.

II. METHODS AND MATERIALS

Precisely describe all components of your fieldwork that produced the results reported.

Employees

List the employees on site and what periods worked, job classes, and previous time spent on the project.

Weir/traps
Discuss the type of weirs and traps used, installation procedures, dates of use, maintenance schedule, enumeration techniques, estimation techniques, AWL technique, etc.

Monitoring
Describe fishery-monitoring duties, such as regulatory marker placement, enforcement, catch estimates, surveys, etc.

Fish pass maintenance
Discuss the seasonal maintenance schedule, removing doors, repairs, performance and fish usage, etc.

-Continued-

Other duties and misc.
Describe the collection of physical data, safety, bear avoidance, etc.

This section should follow the operational plan objectives, tasks, and procedures as a guide. Also, include maps, photographs and diagrams if appropriate.

III. RESULTS

Base this section on the objectives and what was accomplished: Be specific with dates, numbers, and trends. Address each category listed in the methods section. Simple tables and graphs that summarize the data should be included - include all years if possible for comparison.

IV. DISCUSSION AND RECOMMENDATIONS

Include a discussion of each area of data collection, based on the objectives. Elaborate and assess the results with the focus on assisting with future development and refinement of the project. Include recommendations for modifications such as improving trap locations, weir operations, sampling techniques, logistics, and camp improvements. Also include equipment/gear lists that will assist with the following years work.

Note: The crew leader is responsible for the completion of this report. However, crewmembers should be included in drafting the document. The report should be started in season with a rough draft of some form submitted to the Project Biologist for comment one week prior to the end of fieldwork. Upon completion of fieldwork, time will be provided to finalize the report. The final version of the report will be written using Word or Word Perfect software, with tables and graphs constructed in Excel or symphony.

Appendix C. Weekly report format.

To: Steve Schrof
Kodiak Finfish Research Biologist

Date: 5/30/00

From: Rob Baer
Perenosa Finfish Research Biologist

Subject: Perenosa Weekly
Field Report

Initial Trip & General Information

Nathan Stephan and I departed Kodiak for Perenosa Bay at 10:00 AM May 25th 2000. The trip took 4 hours and burned approx. 40 Gallons of fuel. There was a NW breeze at 15 knots, 2-3' swell out of the N.E., visibility unlimited. Hit Tonki Cape within ½ hour of slack tide but it still had 4-6' swells and rips. Upon arrival into Perenosa Bay we inspected both the Pauls and Waterfall systems. Other than a missing anchor and mooring line at Waterfall everything appeared as it was left in 1999. Established camp at Waterfall on the 25th and began setting up camp at Pauls Bay on the 28th.

Waterfall Bay

The barrier seine was installed and fish tight on 5/27. The barrier seine was strung ~60 yards upstream from its traditional location. The new location was chosen due to water depth, current, and access to clean the seine. The bottom skirting will not be fully rocked down until larger negative tides arrive (6/1 & 6/2). Sockeye were first spotted in the bay on the 27th (only about 20 further out in the jaws of the bay). There were no adults spotted anywhere upstream of the barrier seine. On the 29th there were ~100 adult sockeye observed at the barrier seine and ~150 on the 30th. There have not been any sockeye smolt sampled or observed to date.

Pauls Bay

We installed the Pauls Bay weir on 5/29, fish tight at 2:00 PM. Inspected the Pauls Lake and Laura Lake outlet, no sign of adults in Pauls Lake or Laura Creek as of 5/30. Approximately 1000 adult sockeye in the bay on the 30th. Many coho smolt were observed at Pauls Lake outlet and in the Bay but no sockeye smolt sampled or observed to date.

Portage Creek

We inspected Portage Creek for the first time on 5/30. Approximately 500 adult sockeye observed in the bay (inside the comm. Fish markers). We did not observe any adults in the creek. We began hauling weir material up to the weir site on the 30th. No sockeye smolt sampled or observed to date, only coho smolt observed in the creek.

Anticipated Activities

Continue construction of Portage weir and camp site. Maintain barrier seine and Pauls bay weir. Collect and sample sockeye smolt from Waterfall, Portage, and Pauls.

Appendix D. Equipment storage and inventory memorandum.

InterOffice Memo

To:	Development Section staff
From:	Steve Honnold, Area Resource Development Biologist
Date:	April 2, 1997
Subject:	1997 Development Section equipment storage and tracking

The incidence of stolen or missing ADFG and KRAA equipment used for Development Section projects has increased in recent years. This is unacceptable and in need of immediate remedy. (Please refer to the attached memorandum for background information.) This memorandum is intended to provide guidelines to alleviate the problem of missing equipment and will be implemented by all Development Section employees this season. This plan addresses equipment storage, tracking and inventory. Note that some changes have been made from the preliminary plan outlined in the attachment.

1) The equipment (rafts, outboards, batteries, misc.) that was temporarily stored at the bunkhouse was moved to the inner office at the DOT warehouse. This space was assigned to the Development Section in 1996; however, other gear is also occupying a fair amount of this assigned space. The majority of this gear is surplus equipment that will be put up for auction in the spring. Al Spalinger is the contact for this equipment which will need to be relocated before additional Development gear is moved from Devil's Creek.

2) The remainder of the Development Section equipment stored at Devils Creek will be moved by ~May 1. This gear should be sorted and stored at DOT in some logical order. The shelves should be moved first and set up in the van or inner office to provide space for organizing.

3) This year, project crew leaders will be responsible for coordinating with PJ to enable efficient tracking of equipment. A system (some type of check off list) will be developed (or modified) to track all State inventoried equipment and KRAA gear of significant value. These items will include: weatherports, generators, chainsaws, outboard engines, firearms, rafts/skiffs, radios, heaters, batteries, etc. I expect to be able to easily know the whereabouts of our equipment at any given time **(including items in the "shop" for repairs)**. None of the above mentioned type of equipment will be left in a field camp during the off season.

4) All equipment will be put in <u>locked storage</u> when in town awaiting repair or when in transition between field projects. The bunkhouse will not be used for extended storage (aside from the lockers) but may be used for staging for short periods (maximum 24 hours);.

5) The Kodiak Transfer storage unit will continue to be used this season; however, as field projects end this year, gear will be relocated to the DOT warehouse and this unit will no longer be necessary.

I expect the above outlined plan to be adhered to by all Development Section employees. Employees may be held liable for negligent losses and such incidents will be reflected in annual performance evaluations.

Let me know if you have any questions.

cc: W. Donaldson, Probasco, Malloy, Spalinger, Clevenger

Appendix E.1. Instructions for filling out a timesheet.

Timesheets

Field camp personnel have not been filling timesheets out properly. So, this is an instructional on how to properly fill out a timesheet. When a flight comes out to drop off groceries or for any other reason and the flight comes at or near the end of a pay period, camp personnel need to send in their timesheets and an activity report. Fill in the time sheet up to the day you send them in and attempt to project your remaining hours worked.

Pay period: pay periods start on the 1st or 16th of each month and end on the 15th or end of the month (example: June 1-15 or June 16-30).

SSN: your social security number

Name: you guessed it!

Division: Commercial Fish

Day: Monday, Tuesday, etc.

Date: 6/16, 6/17, etc.

Time: start and stop time

Code 1: fill in the number of hours worked for that day (see example).

Work hours total: should be the same number as code 1.

Totals: the code 1 and work hours total columns need to be totaled (see example). If your time sheet is sent in before the end of the pay period, project your time for the remaining days so you can total your columns.

Comments: Fill in the camp location.

Employee's signature and date: You know what to do there.

Crew leaders take the time to look over the crew members timesheet before sending them into town to ensure that they are properly filled out.

Appendix E.2. Example of a completed timesheet.

Pay period ending: 3/15/00 SSN: Your SSN Name: Your Name Division Commercial Fisheries

Record times in military format. Example: 6:00 p.m. = 18:00. If you work past midnight, stop at 23:59 and resume at 00:01 the next day.

Day	Date	Start	Stop	Start	Stop	Start	Stop	Start	Stop	Start	Stop	Leave Taken	Sea Duty	Standby	Hazard	Code 1	Code 2	Code 3	Code 4	Holiday / Leave	Work Hrs Total
Wed	3/1	8:00	12:00	13:00	16:30	18:00	22:00									11.50					11.50
Thu	3/2	8:00	12:00	13:00	17:30											8.50					8.50
Fri	3/3											H 7.50				7.50				7.50	
Sat	3/4	10:00	12:00	13:00	14:00											3.00					3.00
Sun	3/5																				
Mon	3/6	8:00	12:00	13:00	16:30											7.50					7.50
Tue	3/7	8:00	12:00	13:00	16:30											7.50					7.50
Wed	3/8	8:00	12:00	13:00	17:30											8.50					8.50
Thu	3/9	8:00	12:00	13:00	16:30											7.50					7.50
Fri	3/10	8:00	12:00	13:00	16:30											7.50					7.50
Sat	3/11																				
Sun	3/12	9:00	12:00													3.00					3.00
Mon	3/13	8:00	12:00	13:00	16:30											7.50					7.50
Tue	3/14	8:00	12:00	13:00	16:30											7.50					7.50
Wed	3/15	8:00	12:00	13:00	16:30											7.50					7.50
TOTALS														0.00	0.00	94.50	0.00	0.00	0.00	7.50	87.00

EXAMPLE

	Charge to:		
	Notation	CC/LC	%
1		11340033/11340033	100%
2			
3			
4			
		Total	100%

	Comments		Comments
3/1		3/9	
3/2		3/10	
3/3	Holiday not worked	3/11	
3/4		3/12	
3/5		3/13	
3/6		3/14	
3/7		3/15	
3/8			

We certify that the information provided above is true and correct.

Employee's Signature **Date:** ____________

Supervisor's Signature **Date:** ____________

Approving Officer Signature **Date:** ____________

Holiday, Leave, Overtime and Premium Pay Overrides

**Codes	Hours	CC/LC
Leave & Holiday	7.50	No code needed for Leave & Holiday

MALINA LAKE SOCKEYE SALMON SMOLT AND ADULT ENUMERATION PROJECT

OPERATIONAL PLAN, 2002

By
Stephen T. Schrof

Alaska Department of Fish and Game
Division of Commercial Fisheries
211 Mission Road
Kodiak, Alaska 99615

April 2002

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INTRODUCTION

Upper and Lower Malina Lakes (58° 10' N lat., 153° 05' W long.) are located on the southwest side of Afognak Island, approximately 65 kilometers (km) northwest of Kodiak city (Figure 1). The sockeye salmon *Oncorhynchus nerka* sustainable escapement goal (SEG) to the lake system is 15,000 fish with a 10,000 to 20,000 range (Nelson and Lloyd 2001). Prior to rehabilitation efforts, the 10-year average sockeye salmon escapement of 6,700 was well below the estimated SEG (escapements were based on aerial surveys from 1981-1990). Rehabilitation efforts were initiated by the Alaska Department of Fish and Game (ADF&G) and the Kodiak Regional Aquaculture Association (KRAA) in 1991 to increase sockeye salmon production through lake fertilization and supplemental fry stockings, using native stock (Kyle and Honnold 1990).

An adult enumeration weir was installed at the outlet of Lower Malina Lake in 1992 to monitor rehabilitation efforts. Qualitative sampling of sockeye salmon smolt also began in 1992. These projects have continued on an annual basis. Beginning in 1997, the smolt project was expanded to estimate the total smolt emigration using mark-recapture methods. In addition, size and age data of individual smolt were collected.

Assessment of sockeye salmon production at Malina will continue in 2002. Adult salmon escapement will be enumerated, the smolt emigration will be estimated, and biological size and age data will be collected from both life stages and summarized in a field summary report.

Goal

The project goal is to evaluate the restoration of the Malina Lake sockeye salmon stock in terms of smolt and adult escapement production trends.

Objectives

1. Estimate the sockeye salmon smolt population outmigration.
2. Estimate the average age, weight, length (AWL), and condition of sockeye salmon smolt outmigrants from the Malina Lakes.
3. Enumerate the adult sockeye salmon escapement into the Malina Lakes.
4. Estimate the average age, length, and sex ratio (ALS) of the sockeye salmon escapement.
5. Summarize project activities and report data collection results.

Tasks

1. Erect a weatherport and set up camp.
   Target completion date: 9 May – 11 May.
2. Install and operate an incline-plane smolt trap to capture a portion of sockeye salmon smolt outmigrants.
   Target date: 12 May until the end of the smolt migration.
3. Enumerate the daily smolt trap catch of fish by species.
4. Collect AWL data from weekly samples of 200 sockeye salmon smolt (40 smolt per day for five consecutive days).
5. Mark 1,000 (500 minimum) sockeye salmon smolt weekly, using Bismark Brown Y (BBY) dye, to estimate trap efficiency and the total smolt outmigration.
6. Collect physical data daily: air temperature, water temperature, water height, cloud coverage, wind direction and velocity, and precipitation.
7. Install an adult weir.
   Target completion date: 20 May.
8. Enumerate salmonids by species passing through the weir on a daily basis.
9. Sample a minimum of 600 adult sockeye salmon from the total escapement and 200 sockeye salmon from the commercial fishery for ALS data. Sampling should occur proportionally throughout the adult run.
10. Monitor the commercial fishery effort in the Malina Creek Terminal Harvest Area (THA) by recording the number and names of boats fishing and estimating catches by species.
11. Close camp, inventory and store equipment.
    Target date: Friday, 28 June.
12. Write project summary report.
    Final report due date: 1 August.

SUPERVISION

Project Biologist: Steve Schrof

The Project Biologist will provide project oversight and, logistical and technical support.

Field Staff: Geoff Spalinger - crew leader
vacant-- crew member

The crew leader will schedule daily tasks and oversee field operations. The crewmember will assist the crew leader in all assigned tasks and field operation. The crew leader will be responsible for implementation of ADF&G safety guidelines.

PROCEDURES

Smolt Trap Installation, Monitoring, and Maintenance

An incline-plane smolt trap will be located upstream from Malina Bay in the same location as last season (2001; Figure 2). The trap will be installed so the water velocity is sufficient to minimize fish avoidance. Perforated (1/8") aluminum sheeting (4' x 8'), supported by a rackmaster-type pipe frame, will be placed at the entrance of the trap in a "V" configuration to increase trap efficiency. If necessary, the perf-plate 'wings' may be lined with plastic sheeting to increase water velocity in the trap and avoid smolt de-scaling. The trap and wings will be kept free of debris to maintain trap efficiency and minimize smolt mortality. The trap will also require frequent monitoring and maintenance to ensure optimal trap efficiency. Trap monitoring and maintenance are an important aspect of this project and will not be taken lightly. Significant mortality can occur in a short period if the crew does not keep "on top" of trap monitoring and maintenance. Migration patterns may change with significant weather changes (i.e., rain may trigger a large outmigration). The trap will be checked approximately every hour from sunset to sunrise and every four hours during daylight hours. The trap will be fished continuously for the duration of the smolt outmigration (~12 May until ~26 June).

In the event that environmental or other unforeseen conditions occur and smolt trapping must temporarily cease, the trap will be modified or wings pulled to safely allow smolt to pass. If possible, any modifications to the trapping system will be discussed with the Project Biologist before implementation. The exception to this will be if immediate modifications are necessary to avoid major mortality or loss of equipment.

Smolt Trap Catch and Species Enumeration

Since smolt primarily migrate at night, a single trapping (and sampling) day will be the 24-hour period from noon to noon and will be identified by the calendar date corresponding to the first noon. All fish caught in the smolt trap will be counted. A dip net will be used to remove and release the fish as they are counted. Smolt for sampling will be held in a covered live-box. Smolt will be handled with care, as sockeye salmon smolt are very sensitive to any stress, and mortality can occur with the loss of just a few scales. A tally wacker will be used to count the smolt to assure an accurate count. All data, including mortalities, will be entered on the *DAILY SMOLT TRAP CATCH REPORTING FORM* (Figure 3) each time the trap is checked. Daily trapping data will be summarized on the *SOCKEYE SALMON SMOLT SUMMARY FORM* (Figure 4).

If direct enumeration is not possible due to high migration levels, it will be necessary to estimate trap catch using the Catch-Weight Method as described below:

1. A sample of ~150 fish will be dipnetted from the trap and weighed. This weight will be the reference weight for the time period. The time and weight will be recorded in a field notebook.
2. All fish will be counted by species in the reference group, released, and recorded.
3. Subsequent samples will be taken from the trap, weighed, and recorded.

4. A new reference weight will be taken every 10^{th} weight or sooner if size or species composition changes.
5. These data will be transferred to the *CATCH WEIGHT WORKSHEET* (Figure 5) when passage rates slow.

Warning: This method still requires the entire catch to be examined for marks! This technique will be practiced and understood and the equipment needed will be assembled and on site well before the peak of the smolt migration. This technique will be used only as a last resort, when direct enumeration would cause mortalities.

Refer to Pollard's et al. (1997), *Field Identification of Coastal Juvenile Salmonids* key to help alleviate any problems with species identification. Contact the Project Biologist if any questions regarding identification still occur.

Smolt Age, Weight and Length Sampling

A sample of 40 sockeye salmon smolt will be collected per day for five consecutive days per statistical week and sampled for AWL data. In 2002, a statistical week begins on Friday and runs through the following Thursday (Appendix A.1). All smolt sample data will reflect the smolt-day when the fish were captured. Each sample will be taken from a single day's catch and **not mixed between days.** If less than 40 fish are caught in a day, the sample size for that day will be the number of fish caught on that day. A minimum of 900 sockeye salmon smolt will be sampled during the migration. Dyed smolt used to estimate trap efficiency will not be sampled, as they are more susceptible to stress.

The daily sample will be taken randomly. Try to collect smolt hourly and place them in the live box. A small dip net will be used to remove a sub-sample of smolt from the live box to be sampled. All remaining smolt will be released.

Smolt will be sampled on the day of capture. Smolt will be transported in a clean 5-gallon bucket to the sampling area. Another bucket will be used as a recovery bucket. Both buckets will be aerated with battery powered aerators. Tricaine Methanesulfonate (MS-222) will be used to anesthetize the fish; latex gloves will be worn to prevent direct exposure to the anesthetic (see binder in Kodiak office for Material Safety Data Sheet). An experienced individual will demonstrate the use of MS-222 in the field. A small amount of MS-222 will be dissolved in approximately 2 L of water along with an equal amount of baking soda to buffer for pH. The amount of anesthetic will vary depending on water temperature and freshness of the chemical. A few smolt will be placed in this solution until subdued to a point where they can no longer flex their axial musculature but can still ventilate their gills. The ideal strength of the chemical solution should immobilize the smolt in approximately 2-3 minutes.

Smolt lengths will be measured to the nearest millimeter (mm), from the tip of the snout to the fork of the tail (Appendix A.2). Excess water will be removed from the smolt before weighing by using a paper towel as a blotter. Individual smolt weights will be measured to the nearest 0.1-gram (g). A scalpel will be used to remove 5-10 scales from the preferred area (Appendix A.2). The scales will be mounted on a glass slide as demonstrated in Appendix A.3. Scales from five fish will be mounted on each slide. The left portion of each slide will be labeled with AWL number, sample location, species, date, and inclusive fish numbers. After sampling, the fish will be moved to a fresh-water recovery container and held until swimming normally. Both the recovery and pre-sampling holding buckets will be covered to minimize stress on the fish.

AWL data will be collected and recorded in a notebook dedicated to smolt sampling. Data will then be transferred to adult AWL forms, as no smolt AWL forms exist. Personnel collecting the data will record their names on the AWL form (Appendices A.4 – A.5).

All data (slides, forms) will be forwarded to the area office and reviewed on a frequent basis. So, keep data and samples up to date. **All data listed on forms will be duplicated in case originals are misplaced in transit.** The crewleader will edit all data for errors prior to sending to the Kodiak office. This is especially important for the computer AWL forms. Following are some common mistakes to avoid:

1) Scales mounted poorly; too many scales in a smear and slime or debris present when mounting; also smears too close together to avoid mistaking one fish for another.
2) Numbering AWL form improperly. For example, if 70 smolt are sampled in one day (day 1), the AWL numbers should be started at AWL 001 for the first 40 smolt sampled (fish 1-40; 8 slides). Then, AWL 002 should contain the last 30 smolt sampled, labeled 1-30; (6 slides), not 41-70. The next day will start with AWL 003 (fish 1-40) and so on.
3) "# of cards" mislabeled; enter "1" even if there are two scale cards or slides.
4) Damaged AWL forms (computer - Mark sense); do not bend, fold, tape, staple, etc. these forms. Otherwise, the computer will not read them correctly.
5) Scales from one fish contaminating the smear from the next fish; wipe the scalpel blade off between each fish.

Smolt Trap Efficiency and Mark-Recapture

In order to estimate the total sockeye salmon smolt outmigration from Malina Lakes, the trap efficiency will be determined. For this reason, mark-recapture trials will be conducted using BBY dye. The marking process can be very stressful for smolt. All effort will be made to minimize and avoid unnecessary stress to the smolt during the process. Excessive handling (netting), increased water temperatures, and exposure to the dye are the primary stresses. Individually, these can induce mortality. In combination, significant mortality may occur. The following methods will be used for marking and releasing smolt:

1. All data will be recorded on the *Smolt Dye Release Form* (Figure 6).
2. Once a week, a sample of 1,000 (500 minimum) sockeye salmon smolt will be collected for marking. If run strength is not sufficient to capture all 1000 smolt in one night, smolt will be collected and held in a live-box for up to three evenings. The number of smolt collected after three nights will be marked. Do not use the smolt captured for AWL samples for the dye tests.
3. Marking will take place at the release site, located ~650 meters upstream from the trapping site. The smolt will be transported by backpack to the mark/release site. A plastic bag will be

placed in each backpack and sufficient water added to minimize over-crowding. Add approximately 150-200 smolt to each bag. Water temperatures will be recorded. Supplemental oxygen will be added to each bag and the bags sealed. Any mortality will be recorded upon arrival at the release site.

4. Water temperatures will be taken from both the bag and the recovery container in the stream. If the temperatures differ by more than 1-2 degrees, the bags of fish will be floated in the recovery container until temperatures stabilize. The smolt will be allowed to rest in the recovery container for 30 minutes before placing them into the dying container. The container will be covered to minimize stress.
5. 1.9 g of BBY dye will be dissolved in 15 gallons of water in a 30-gallon plastic garbage can. The smolt will be placed in the dye for 30 minutes and the garbage can will be covered and oxygenated continuously (but gently - do not roll them) during the dyeing process.
6. Following dyeing, all dyed smolt will be held in the live-box for a minimum of 60 minutes. Smolt displaying "abnormal" behavior will NOT be released.
7. Dyed smolt displaying "normal" behavior will be counted and released evenly across the creek in the vicinity of suitable cover. The process should be timed such that smolt will be released at ~2200 hrs.
8. Monitoring of the smolt trap for marked smolt incidence will commence the day of the release and continue until the next dye test. The trap efficiency will then equal the percentage of dyed fish recovered. The number of dyed smolt observed will be recorded on the *Daily Smolt Catch Reporting Form* (Figure 3) and the *Sockeye Salmon Smolt Summary Form* (Figure 4). The number of smolt examined in a day equals the marked and unmarked smolt caught that day. The daily smolt catch will not include marked smolt, since they were previously counted at the trap site.

Physical Data

Physical data will be collected at 1200 and 2400 hours. Information will be recorded on the *DAILY PHYSICAL OBSERVATION FORM* (Figure 7) and will include water temperature, air temperatures, stream height, percent cloud cover, wind direction and velocity, and precipitation. A depth gauge will be placed upstream of the weir to provide relative water level data.

Weir Installation

The adult weir will be installed at Malina Creek a few hundred meters from Malina Bay by 20 May. Wooden tripods with attached 4x4 stringers will be placed across Malina Creek, and aluminum conduit panels will be placed on the upstream side of the tripods. Sandbags will be placed at the base of the panels to seal the weir. Two gates will be included in the weir. Located upstream from one of the gates will be a "Scott" six panel salmon trap for collecting fish for sampling. Upstream of the other gate (tally gate), a white board will be placed for identifying fish as they are counted into the lake.

Escapement Counts and Weir Maintenance

When a sufficient number of fish build-up behind the weir, the tally gate will be opened and fish will be counted. A tally wacker will be used to assure accurate counts. Sockeye salmon "jacks" (one-ocean fish) and net marked fish will be tallied as sub-categories. During the field season sockeye salmon judged to be $\leq$375mm will be designated as jacks. Steelhead trout *Oncorhynchus mykiss* migrating from the lake will also be enumerated. Daily and cumulative counts will be recorded on the *WEEKLY SALMON WEIR COUNT REPORT FORM* (Figure 8). All debris will be removed from the weir in a timely manner. The weir will be checked twice daily, to ensure it is fish tight. Any modifications or work done on the weir will be documented in the daily camp log.

Adult Salmon Age, Length, and Sex Sampling

When sufficient numbers of adult sockeye salmon begin to enter the creek, samples will be collected for age (scale), length and sex data. A goal of 80 samples per week should be followed to acquire a minimum of 600 adult sockeye salmon scales total for the season. **Sampling will be distributed throughout the escapement period proportional to approximate run strength.** Sampling instructions are located in Appendix B.

Catch Sampling

Adult sockeye salmon caught in Malina Bay will be sampled for age, length and sex data with a minimum goal of 200 samples for the season. Sampling goals may be adjusted depended on access to the fishery and excess salmon abundance.

Fishery Monitoring

In the event that the sockeye salmon escapement goal to Malina Lake has been achieved, a commercial fishery will be conducted to harvest the surplus in the Malina Creek THA (Figure 2). Assessments of sockeye salmon run strength will be relayed to Area Management Biologists at 0800 and 2000 hour radio schedules (see Safety and Radio Schedule Section). The crew leader will be responsible for coordinating the opening of the fishery under direction of the Management Biologist. Throughout the fishery, the number of vessels fishing and tender vessel names, and estimated catch by species each day will be recorded on the *Malina Creek Terminal Harvest Area Fishery Monitoring Reporting Form* (Figure 9).

OTHER REQUIREMENTS

Safety

Each employee will receive CPR-First Aid Certification as required by the ADF&G SOP, prior to assignment to the Malina project. In addition, each employee will review the required sections of the ADF&G guidelines.

Specific guidelines to review include:

- Safety Policy/ Standards
- Building Safety
- Field Camp Safety
- Aircraft Safety/ Passenger
- Emergency/ Survival Equipment Required in Aircraft
- Boating Safety
- Vehicle Safety
- Laboratory Safety
- Small Tool Handling
- Firearm/ Bear Safety

There is supplemental safety information in the office safety files available for review. Project crew leaders will be responsible for providing the necessary equipment and information to field technicians. The ADF&G's field safety policy will need to be reviewed by each field crewmember prior to field assignment. **Each employee is responsible for reviewing the safety training materials.**

Training

In addition to mandatory CPR and First Aid training, each field personnel will also receive training on Salmon Sampling Protocols in the field.

Radio Schedule

Kodiak office personnel will contact field camps by SSB radio. The Commercial Fishery Division morning radio schedule is from 0800 - 0845 hours daily. During the smolt season, office personnel will contact the crew leaders at 1300-1315 hours Monday through Friday and at 2030 hours on Saturday and Sunday. If contact is necessary at other times, information can be relayed via the Commercial Fish Management Section schedule at 0800 and 2000 hours. The frequency for Fish and Game contact is 3230 kHz. **ALL FIELD PERSONNEL WILL BE AWARE OF EMERGENCY CONTACT PROCEDURES POSTED ON EACH RADIO.** The emergency Coast Guard frequency is **4125 kHz**. The Malina weir camp is located at **58°9.7' N, 153° 9.0' W.** Crew leaders must train crew members in the proper use of communication on the SSB radio. Training will include, determining proper radio frequency for the proper agency intending to communicate with (i.e. Fish and Game – 3230 kHz). In order for crew members to become more familiar with operating the radio, the crew will need to communicate with the Management biologist during 2000 hour radio schedule at least several times per week.

Air Charters

All air charters will be set up through Kodiak staff. Appropriate information in regard to charters will be relayed through daily radio contact. It is important to contact office personnel when any data, equipment or other freight will be "back hauled" to Kodiak.

Reporting

Crew leaders will be responsible for recording all of the job activities and compiling biological data. <u>Pencil</u> rather than a pen will be used for data entry. Data forms and a field log will be completed daily. "Rite in the rain" logbooks will be used while collecting data and data will be transferred to data forms after returning to the weatherport. Use a number 2 pencil when filling in the AWL forms. Data will be reported to Kodiak staff via SSB radio. Completed data forms will be sent to Kodiak as planes permit. Data that is sent to Kodiak will be properly packaged and labeled. **Data forms will be duplicated in case originals are misplaced in transit.**

A report of project activities will be sent to town weekly, or on the next available plane. A one page weekly report is sufficient (Appendix C).

Camp Inventory and Close Up

The Malina Lakes project equipment will be inventoried prior to camp close up. Inventory forms will be provided. Items of high value will be returned to Kodiak and stored in accordance with the "1997 Development Section Equipment Storage and Tracking" memorandum (Appendix D). A list will be made of equipment needed for the 2003 field season. The weatherport platform and out buildings will be secured prior to leaving the field.

Video/ Photo Documentation

Crew leaders will be responsible for photo documenting project activities. Specific aspects such as trap installations, weir construction, and other detailed tasks are important to photograph. When possible, ADF&G cameras and film will be used. If, however, State cameras are not available, film will be provided for use with personal cameras. The use of personal cameras is suggested in this case, but not required. The ADF&G will pay for developing film.

Performance Appraisal

Crew leaders are responsible for evaluation of each crew members performance during the project operations. A performance evaluation will be written for each crewmember at the end of the project. These evaluations will be written on the State of Alaska Performance Evaluation Report Form (Appendix E). Individuals who write these project evaluations will be referred to in the final evaluation written by the Project Biologist. Crew leaders should keep crewmembers appraised of their performance during the project.

Timesheets

There have been past problems with incomplete and incorrect timesheets. Therefore, the following summarizes how to properly fill out a timesheet. When a flight comes out to drop off supplies and the flight comes at or near the end of a pay period, camp personnel need to send in their timesheets and an activity report. Fill in the time sheet up to the day you send them and attempt to estimate your remaining hours to be worked during the pay period.

Pay period: pay periods start on the 1st or 16th of each month and end on the 15th or end of the month (example: June 1-15 or June 16-30). See Appendix F for the instructions and an example of a correctly filled out timesheet.

Crew leaders should take the time to look over the crew members timesheet before sending them into town to ensure that they are properly filled out. The crew leader should plan work activities to be completed in a 7.5-hour day. All overtime worked must be pre-authorized by the Project Biologist.

Purchasing

During the field season, field crews will require additional items (e.g., groceries, fuel, or tools). Small lists may be read over the radio during the scheduled radio meeting; however, these lists should be limited to just a few items. It should be remembered that radio time is limited and there are a number of other camps region-wide that are using the same frequency. Longer lists of materials should be sent to town on supply flights. Blank grocery lists will be sent to the field and the crew leader should remember to send orders in advance to ensure the correct grocery order for the next supply flight. It should also be remembered that the Malina Lake budget allocates $20/day/person and this allocation will not be exceeded. Crew leaders should track grocery expenses and limit the number of requested specialty items. Similarly, planning should be made for fuel. Fuel is a necessity for many camp operations including heating the facility. However, past camps have left stoves on during the day while the crew was working outside unnecessarily burning fuel. These situations should be minimized.

LITERATURE CITED

Kyle, G.B. and S.G. Honnold. 1990. Limnological and fisheries evaluation of sockeye salmon production (*Oncorhynchus nerka*) in Malina Lakes for fisheries development. Alaska Department of Fish and Game, FRED Division, Report Series 110:40 p.

Nelson, P.A. and D.S. Lloyd. 2001. Escapement Goals for Pacific Salmon in the Kodiak, Chignik, and Alaska Peninsula/ Aleutian Islands Areas of Alaska. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 4K01-66, Kodiak.

Pollard, W.R., C.F. Hartman, C. Groot, and P. Edgell. 1997. Field Identification of Coastal Juvenile Salmonids. Harbour Publishing. Maderia Park, B.C. Canada. 31p.

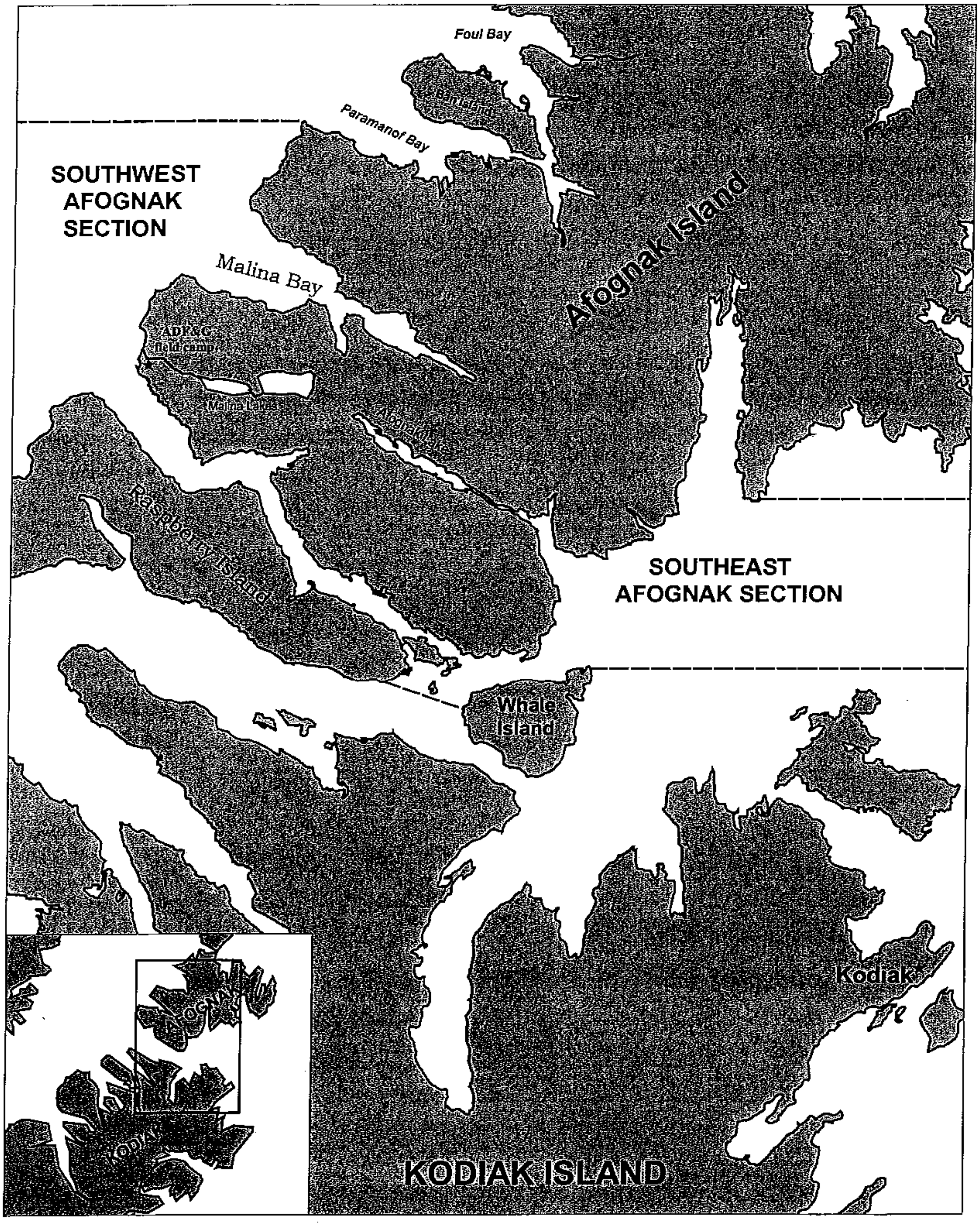


Figure 1. Location of the Malina Lakes on Afognak Island.

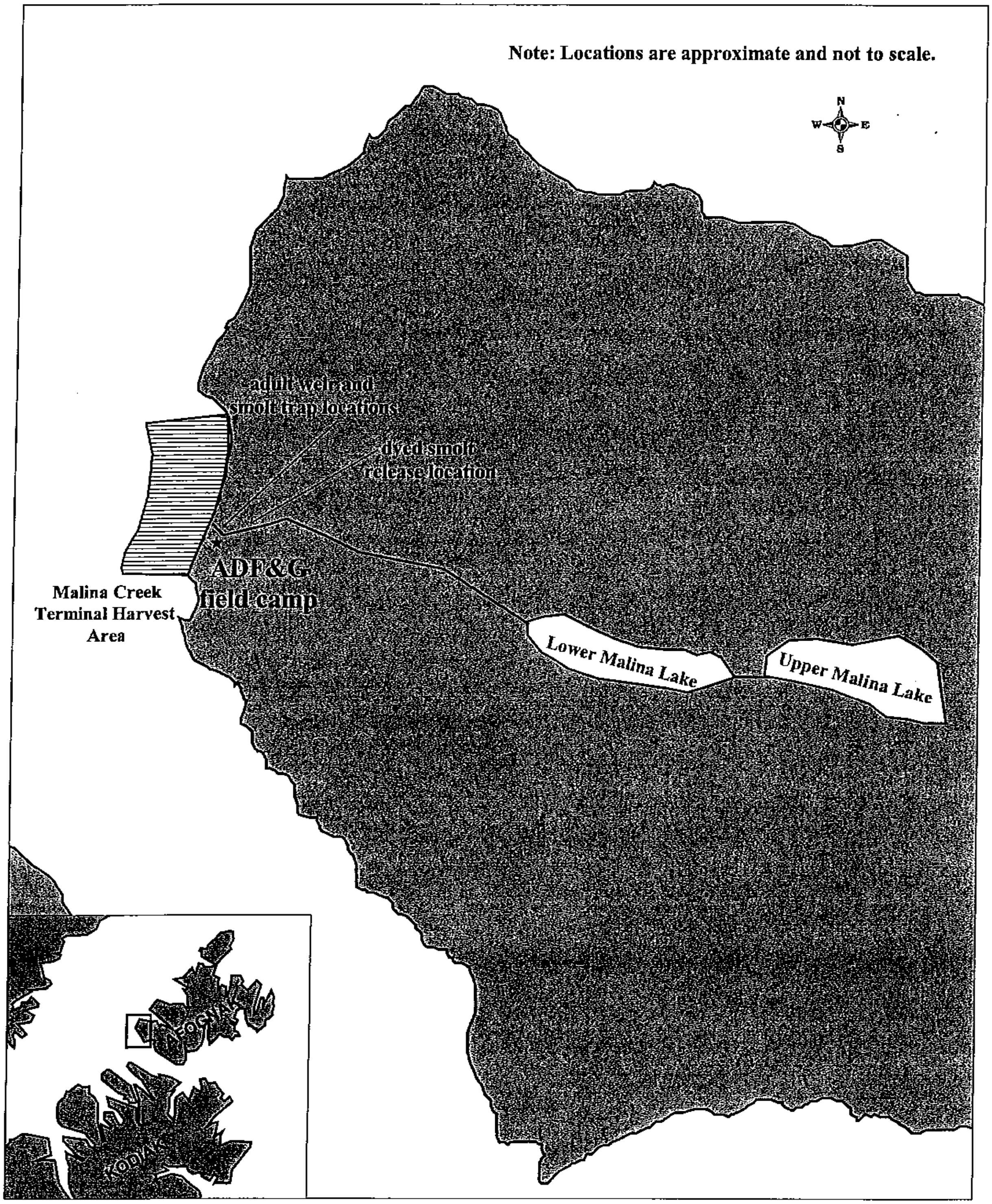


Figure 2. Location of the ADF&G camp, adult and smolt sites, and terminal harvest area for the Malina Lakes rehabilitation project on Afognak Island.

DAILY SMOLT CATCH REPORTING FORM

page______of______

PROJECT: **MALINA LAKES** DATE ________________ TRAP LOCATION: **Lower Malina Creek**

TIME (military)	SOCKEYE SMOLT (numbers)					OTHER (numbers)						COMMENTS[2]
	CATCH[1]	EXAMINED FOR MARKS	MARKED RECOVERIES	TRAP MORTALITY	LIVEBOX MORTALITY	COHO	PINK	DOLLY VARDEN	STICKLEBACK	RAINBOW	OTHER	
TOTAL												

[1] Catch number includes marked recoveries and mortality. Asterick weight based estimates and attach Catch Weight Worksheet.
[2] To be included in comments: significant water level changes, any difficulties determining marked fish, problems, observations.

Figure 3. Daily smolt trap catch reporting form.

SOCKEYE SALMON SMOLT SUMMARY FORM

page_____of_____

PROJECT: **MALINA** YEAR: **2002** TRAP LOCATION: **Lower Malina Creek**

DATE[1]	NUMBER OF SMOLT								COMMENTS:
	CATCH[2]			SAMPLED		# MARKED	MARKED RECOVERIES[4]		
	DAILY	CUMULATIVE	MORTS[3]	DAILY	CUM	RELEASED	DAILY	CUM	

[1] Each date covers a 24-hour period extending from noon to noon and identifies the starting date.

[2] Numbers of fish caught includes marked recoveries. Should equal CATCH: TOTAL on Catch Reporting Form.

[3] Includes both trap and live box mortality.

[4] Reset after each release. Include Daily Marked Recoveries in the Daily Catch because they were not previously counted.

Figure 4. Sockeye salmon smolt summary form.

CATCH WEIGHT WORKSHEET

Date:

page______of______

Location: **Malina**

	Reference Group							Total Estimated Population							
		Species Composition						Sum Group	Estimate	Species Composition[3]					
Period (hrs)	Weight	sockeye	coho	Dolly Varden	rainbow	other	Total Catch	Wt's[1] ( )	Multiplier[2]	sockeye	coho	Dolly Varden	rainbow	other	Total Catch
Totals:															

[1] Add up all weights determined for the period, including the reference weight.

[2] Divide the "Sum Group Wt.'s" by the reference "Weight" to determine multiplier.

[3] Take the number of species tallied in the reference group times the "Estimate Multiplier" to determine total outmigration by species for a given period.

COMMENTS:

Figure 5. Catch weight worksheet.

SMOLT DYE RELEASE FORM

page_____of_____

DATE (actual): ____________________

CREW NAMES (Print) ____________________

PROJECT LOCATION: **MALINA**

____

NUMBER OF FISH COLLECTED: __________
(from live box)

CREW LEADER ____________________
(signature)

	COLLECTION LIVE BOX	DYE TUB	RECOVERY CONTAINER	TRANSPORT BUCKET	STREAM RELEASE
START TIME (military)					
START TEMP (degree celsius)					
END MORTALITY (number of fish)					
OXYGEN SUPPLEMENT O_2 or aerator(A)					

DYE SOLUTION (mixture): __________ DYE (grams); __________ WATER (gallons)

RELEASE SITE LOCATION (distance upstream of trap site, in meters): __________

TOTAL NUMBER OF DYED FISH RELEASED: __________

COMMENTS:

Figure 6. Smolt dye release form.

DAILY PHYSICAL OBSERVATIONS

PROJECT **MALINA** YEAR 2002 page____of____

DATE	TIME	SITE[1]	TEMPERATURE (C)		CLOUD COVER		VISIBILITY (mi)	WIND		GAUGE HEIGHT (cm)	COMMENTS (i.e., rain, drizzle, etc...)
			Air	Water	Percent (%)	Ceiling		Direction	Vel. (kts)		

[1] Weir Site = W; Smolt Site = S

Figure 7. Daily physical observation form.

ALASKA DEPARTMENT OF FISH AND GAME
KODIAK MANAGEMENT AREA
WEEKLY SALMON WEIR COUNT REPORT FOR YEAR: **2002**

WEIR CAMP
NAME: MALINA PERSONNEL:____________________ PAGE:_____ OF _____ WEEKLY REPORT FOR WEEK ENDING (SATURDAY) ____________________

DATE		DAILY TOTAL ESCAPEMENT							STEELHEAD	REDS	JACK	JACK	NET	INJURED	WATER LEVEL	H_2O	WEATHER		
		REDS	L. REDS	KINGS	PINKS	COHOS	CHUMS	DOLLY V.	DOWN	SAMPLED	NO.	%	MARKED	REDS	(cm)	TEMP	CEIL.	VIS.	WIND DIR/SPD.
SUN	D																		
	A																		
MON	D																		
	A																		
TUE	D																		
	A																		
WED	D																		
	A																		
THU	D																		
	A																		
FRI	D																		
	A																		
SAT	D																		
	A																		
WEEK TOTAL															COMMENTS:				
															COMMENTS:				
AWL WEEK															COMMENTS:				
AWL ACCUM														COMMENTS:					

ADDTITIONAL COMMENTS: BEAR AND PEOPLE PROBLEMS; SMOLT MIGRATION; WEIR PROBLEMS; CABIN REPAIR; NOTE AIRCRAFT TRAFFIC

Figure 8. Weekly salmon weir count reporting form.

Malina Creek Terminal Area Fishery Monitoring Reporting Form.

Date	Number of Boats	Estimated Harvest								Number of scales Collected
		Sockeye		Pinks		Chums		Chinook		
		Daily	Cumulative	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative	
Totals										

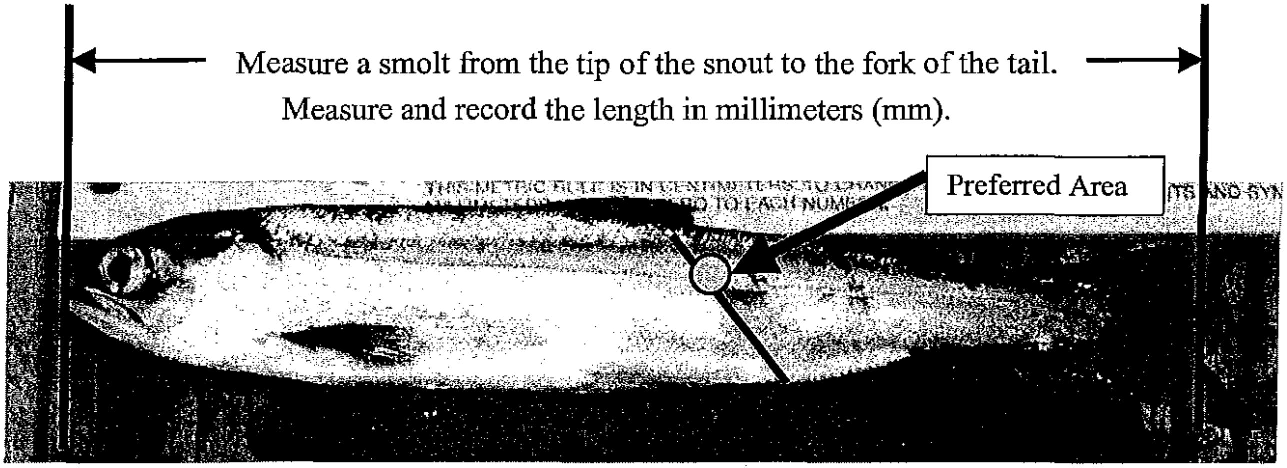
Figure 9. Malina Creek Terminal harvest Area fishery monitoring reporting form.

APPENDIX

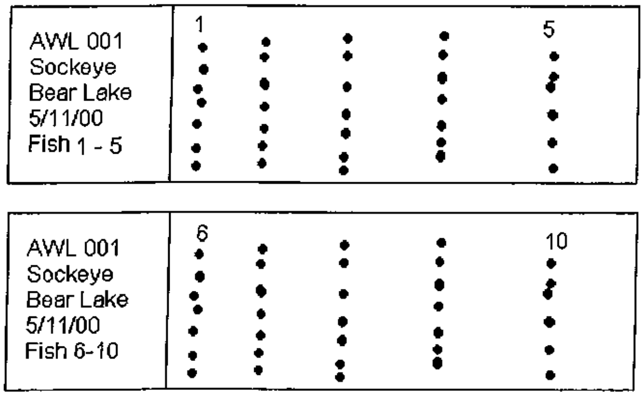
Appendix A.1. Sampling weeks and associated calendar dates, 2002.

Week	Calendar Dates	Week	Calendar Dates
1	01-Jan to 03-Jan	28	05-Jul to 11-Jul
2	04-Jan to 10-Jan	29	12-Jul to 18-Jul
3	11-Jan to 17-Jan	30	19-Jul to 25-Jul
4	18-Jan to 24-Jan	31	26-Jul to 01-Aug
5	25-Jan to 31-Jan	32	02-Aug to 08-Aug
6	01-Feb to 07-Feb	33	09-Aug to 15-Aug
7	08-Feb to 14-Feb	34	16-Aug to 22-Aug
8	15-Feb to 21-Feb	35	23-Aug to 29-Aug
9	22-Feb to 28-Feb	36	30-Aug to 05-Sep
10	01-Mar to 07-Mar	37	06-Sep to 12-Sep
11	08-Mar to 14-Mar	38	13-Sep to 19-Sep
12	15-Mar to 21-Mar	39	20-Sep to 26-Sep
13	22-Mar to 28-Mar	40	27-Sep to 03-Oct
14	29-Mar to 04-Apr	41	04-Oct to 10-Oct
15	05-Apr to 11-Apr	42	11-Oct to 17-Oct
16	12-Apr to 18-Apr	43	18-Oct to 24-Oct
17	19-Apr to 25-Apr	44	25-Oct to 31-Oct
18	26-Apr to 02-May	45	01-Nov to 07-Nov
19	03-May to 09-May	46	08-Nov to 14-Nov
20	10-May to 16-May	47	15-Nov to 21-Nov
21	17-May to 23-May	48	22-Nov to 28-Nov
22	24-May to 30-May	49	29-Nov to 05-Dec
23	31-May to 06-Jun	50	06-Dec to 12-Dec
24	07-Jun to 13-Jun	51	13-Dec to 19-Dec
25	14-Jun to 20-Jun	52	20-Dec to 26-Dec
26	21-Jun to 27-Jun	53	27-Dec to 31-Dec
27	28-Jun to 04-Jul		

Appendix A.2. Photo of a smolt with the preferred area highlighted.



Appendix A.3. Salmon smolt glass slide example.



Appendix A.4. Procedure for sampling salmon smolt for age-weight-length data.

AWL Forms

Use the new AWL forms; do not use the red or blue AWL forms because they are out of date. Smolt length and weight will be recorded on AWL forms (Appendix A.5). Using a no. 2 pencil, complete each section of the left side of the AWL and darken the corresponding blocks.

Description: Include species (sockeye smolt), location, year, and samplers.

Card: The AWL forms and corresponding slides are numbered sequentially by date throughout the season starting with #001. A new, consecutively numbered form is used each day even if the previous card is not completed. There may be a minimum of one fish and a maximum of 40 fish (8 slides) per AWL form.

Species: Refer to the reverse side of the AWL form to obtain species: **sockeye = 2.**

Day, Month, Year: Use the appropriate digits for the date fish are sampled.

District, Subdistrict, Stream, Location: Malina Creek is **251-10-105-042.**

Period: List the period in which the fish were sampled (refer to Appendix A.1).

Project: Refer to the reverse side of the AWL form to obtain a code; **code 8** will be used for smolt.

Gear: Refer to the reverse side of the AWL form to obtain a code; **00 = trap.**

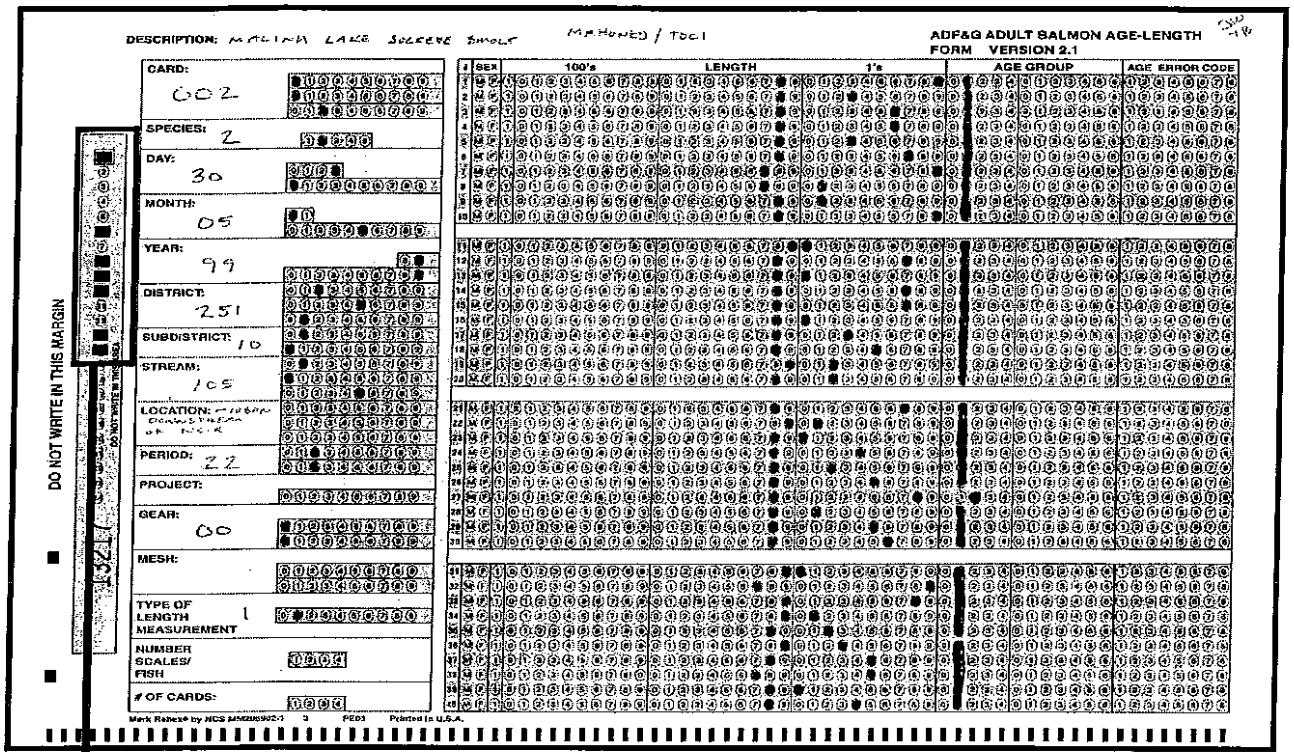
Mesh: Leave blank.

Type of Length Measurement: Refer to the reverse side of the AWL form to obtain a code; **1 = Tip of snout to fork of tail.**

Number of Scales: Put a number **1** (refers to the column of scales per fish, which is one).

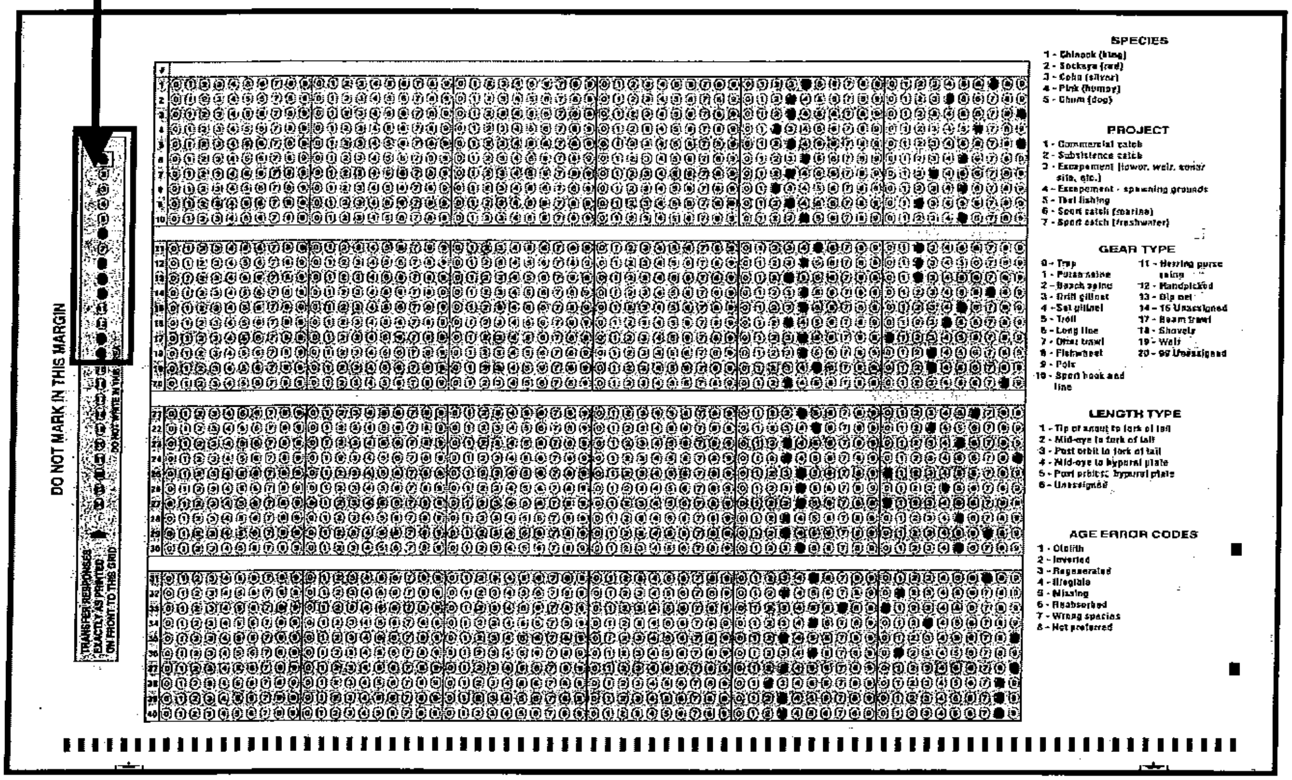
# of Cards: Put a number **1**. Keep litho codes in numerical order throughout the season and be sure to transfer the litho code from the front left side to the backside of the AWL form. These forms will be optically scanned and stray marks may be misinterpreted. It is the crew leaders responsibility to make sure that all forms are carefully edited before returning them to your supervisor.

Appendix A.5. Example of an AWL form filled out properly for smolt sampled.



Fill in litho codes.

Backside of AWL



Appendix B.1. Completing the Opscan (AWL) Forms:

Procedures

In 1996, the department purchased a new optical scanner, which requires the use of green AWL forms. Before transcribing any information, make sure the correct form is being used. The department no longer uses the red or blue forms, which were associated with the old scanner.

A completed AWL form and accompanying gum card for sampling sockeye salmon are shown in Appendix B.4.

Complete each section on the left side of the AWL form using a No. 2 pencil and darken the corresponding circles as shown in the figures. Make every effort to darken the entire circle as the optical scanner, which reads and records the data from the AWL forms may not recognize partially filled circles. Label only one form at a time to avoid a "carbon paper effect" resulting in stray marks. Special care should be used to assure that stray marks do not occur on either side of the AWL form.

Appendix B.2. Procedure for sampling adult salmon for age-sex-length data.

AWL Forms

Use the new AWL forms; do not use the red or blue AWL forms because they are out of date. Adult sex and length will be recorded on AWL forms (Appendix B.4). Using a no. 2 pencil, complete each section of the left side of the AWL and darken the corresponding blocks:

Description: Include species (adult sockeye), location, year, method of capture (purse seine, weir) and samplers.

Card: The AWL forms and gum cards are numbered sequentially by date throughout the season starting with #001. A new, consecutively numbered form is used each day even if the previous card is not completed. There may be a minimum of one fish and a maximum of 40 fish per AWL form.

Species: Refer to the reverse side of the AWL form to obtain species: **sockeye = 2.**

Day, Month, Year: Use the appropriate digits for the date fish are sampled.

District, Subdistrict, Stream, Location: Consult the project leader for the appropriate codes **(Malina is 251-10-105-042).**

Period: List the period in which the fish were sampled (refer to Appendix A.1).

Project: Refer to the reverse side of the AWL form to obtain a code **(commercial catch = 1).**

Gear: Refer to the reverse side of the AWL form to obtain a code; **01 = purse seine.**

Mesh: Leave blank.

Type of Length Measurement: Refer to the reverse side of the AWL form to obtain a code **(2 = mid-eye to fork of tail).** Measure the fish from mid-eye to the fork of the tail (Appendix D.8).

Number of Scales: Put a number **1** (refers to the column of scales per fish, which is one).

# of Cards: Put a number **1**. Keep litho codes in numerical order throughout the season. These forms will be optically scanned and stray marks may be misinterpreted. It is the crew leaders responsibility to make sure that all forms are carefully edited before returning them to your supervisor.

Appendix B.3. Some reminders.

1. Place the fish on its right side to sample the left side.

2. Determine the sex of the fish (escapement sampling only) and darken M or F in the sex columns. If any difficulty is encountered with this procedure, write "I had trouble sexing these fish" on the top margin of the AWL and ask your supervisor for help as soon as possible before sexing additional fish.

3. Measure fish length in millimeters from the mid-eye to fork-of-tail (escapement sampling only; Appendix B.6). Record length by blackening the appropriate column circles on the AWL form. Column 3 on the AWL form is used for fish with a length greater than 999 millimeters (Chinook). Measure all species of salmon to the nearest mm. When collecting length data, take care to ensure that each length corresponds to the appropriate scale mounted on the gummed card as length at age is evaluated for each sample.

4. Remove the "preferred scale" from the fish by grasping its exposed posterior edge with forceps and pulling free. Remove all slime, grit, and skin from the scale (neoprene wristers work well for this). The "preferred scale" is located on the left side of the fish, two rows above the lateral line on the diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin (Appendix B.7). If the "preferred scale" is missing, select a scale within the preferred area on the other side of the fish. If no scales are present in the "preferred area" on either side of the fish, sample a scale as close to the preferred area as possible and darken the 8 under "age error code" on the AWL form. Do not select a scale located on the lateral line.

5. It is important to take care that scales adhere to the card, rough side up. Therefore, without turning the forceps over, clean, moisten, and mount the scale on the gummed card with your thumb or forefinger. Exert just enough pressure to spread and smooth the scales directly over the number as shown in Appendix B.7. The ridges on the sculptured side can be felt with a fingernail or forceps. Mount scale with anterior end oriented toward top of gum card. All scales should be correctly oriented on the card in the same direction (Appendix B.8).

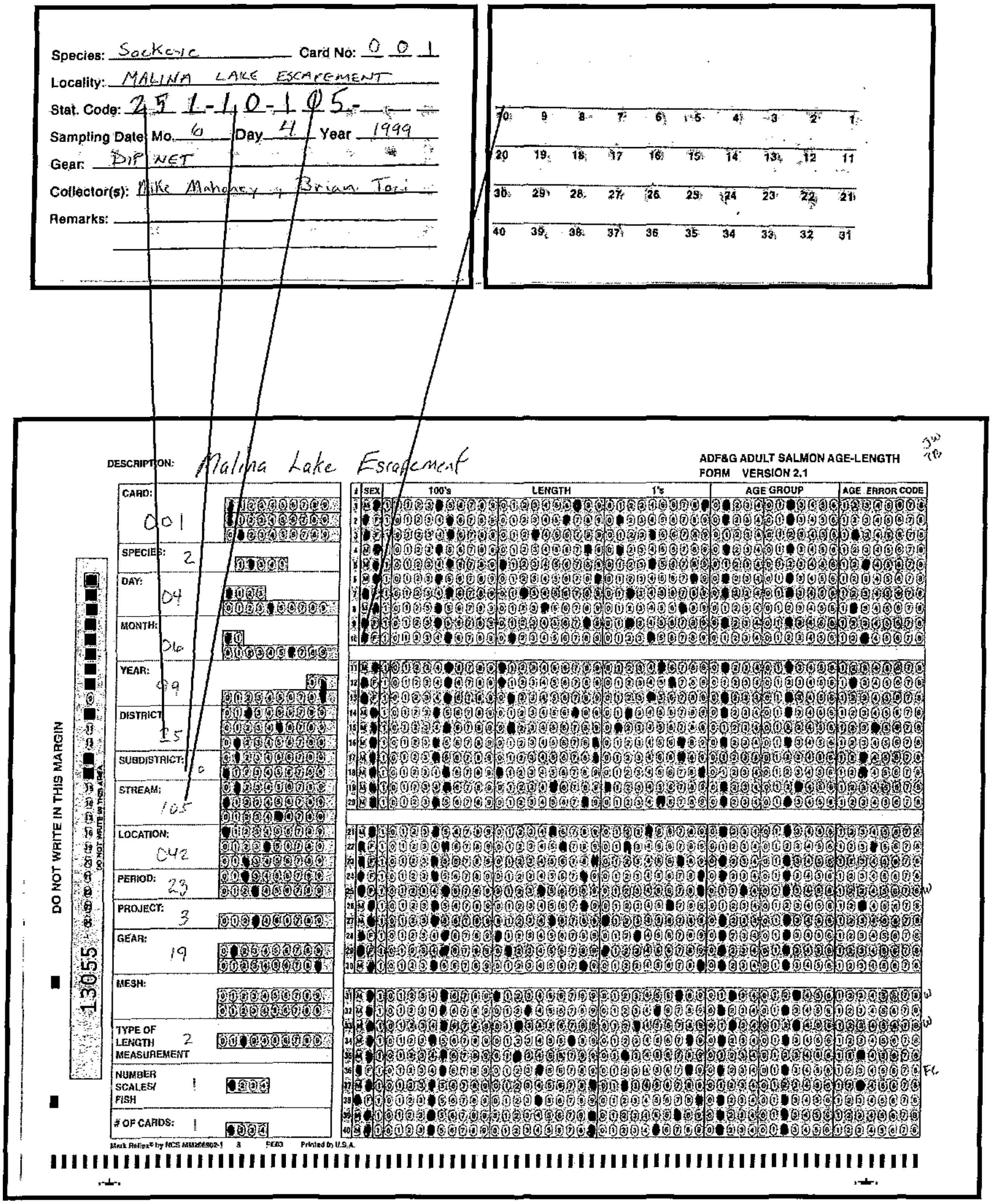
6. Repeat steps 1 through 4 for up to 40 fish on each AWL form.

7. When sampling at weirs you may use write in rain books to record the data. Keep the AWL forms in camp where they will be clean, dry, and flat. After sampling is done for the day transfer the data to the mark-sense forms. **Each length, sex, and scale must correspond to a single fish! It is the responsibility of the crew leader to be sure the data has been transcribed correctly and the AWL forms filled out completely. Log books containing length and sex data should be returned to Patti Nelson at the end of the season**. These are considered raw data and need to be archived. If you choose to record raw data on tape, these tapes must be returned to Patti Nelson.

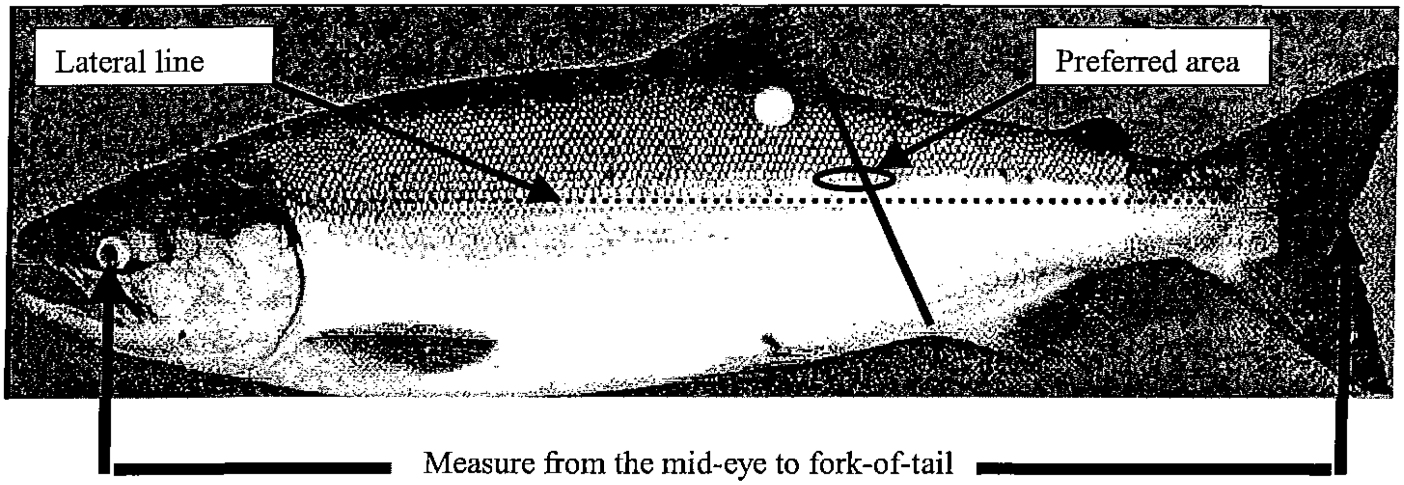
SAMPLING CHECKLIST

OPERATIONAL PLAN	PENCILS (NO. 2)
GUM CARDS	FORCEPS
AWL FORMS/LOG BOOK	PLASTIC CARD HOLDERS
NEOPRENE WRISTERS	CLIPBOARD

Appendix B.4. Completed adult salmon AWL (front side) and associated gummed card.



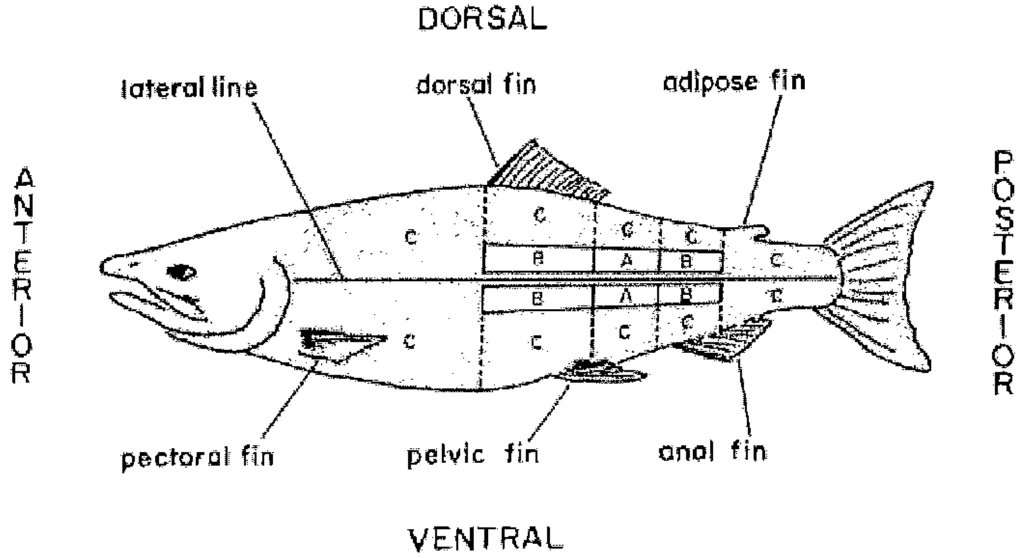
Appendix B.5. Measuring fish length mid-eye to fork-of-tail.



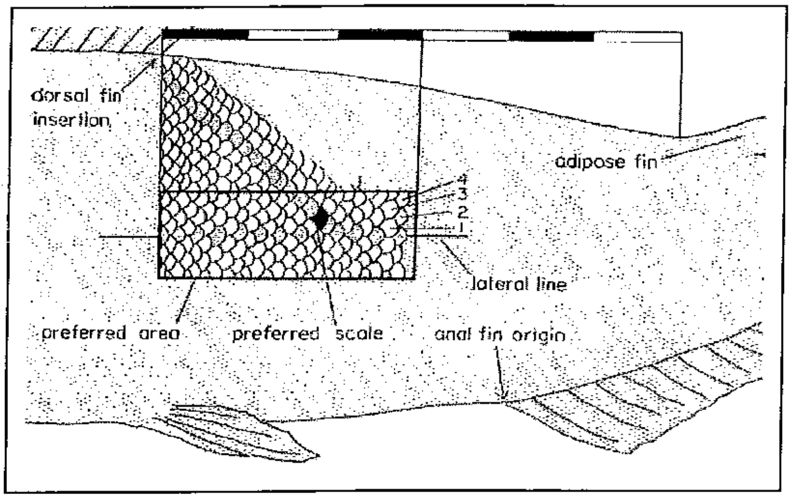
Mid-eye to fork-of-tail lengths are taken because the shape of the salmon's snout changes as it approaches sexual maturity. The procedure for measuring by this method is as follows.

1) Place the salmon flat on its right side (on the measuring board) with its head to your left and the dorsal fin away from you.
2) Slide the fish in place so that the middle of the eye is in line with the edge of the meter stick and hold the head in place with your left hand.
3) Flatten and spread the tail against the board with your right hand.
4) Read and record the mid-eye to fork length to the nearest millimeter.

Appendix B.6. Removal and mounting of the preferred scale.

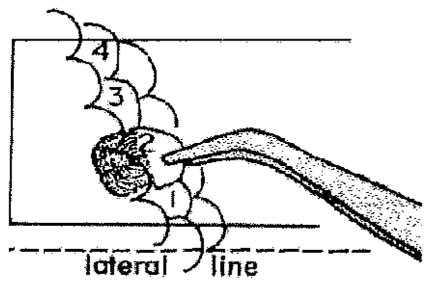


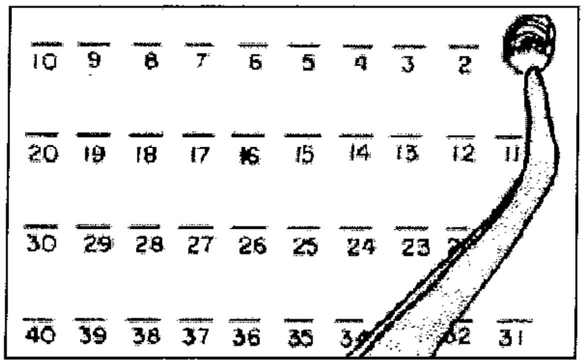
INPFC rated areas for scale removal. Area A is the preferred area. Area B is the second choice if there are no scales in area A. Area C designates non-preferred areas. If scales on the left side are missing, try the right side.



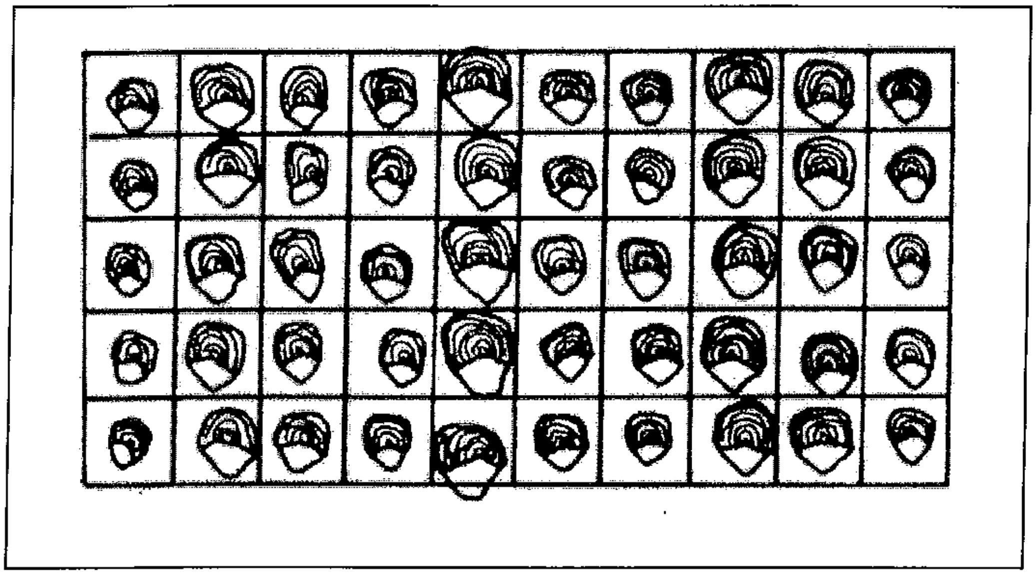
The preferred scale in this diagram is solid black. It is located 2 rows up from the lateral line, on a diagonal from the insertion (posterior) of the dorsal fin "back" toward the origin of the anal fin.

Do not turn scale over.

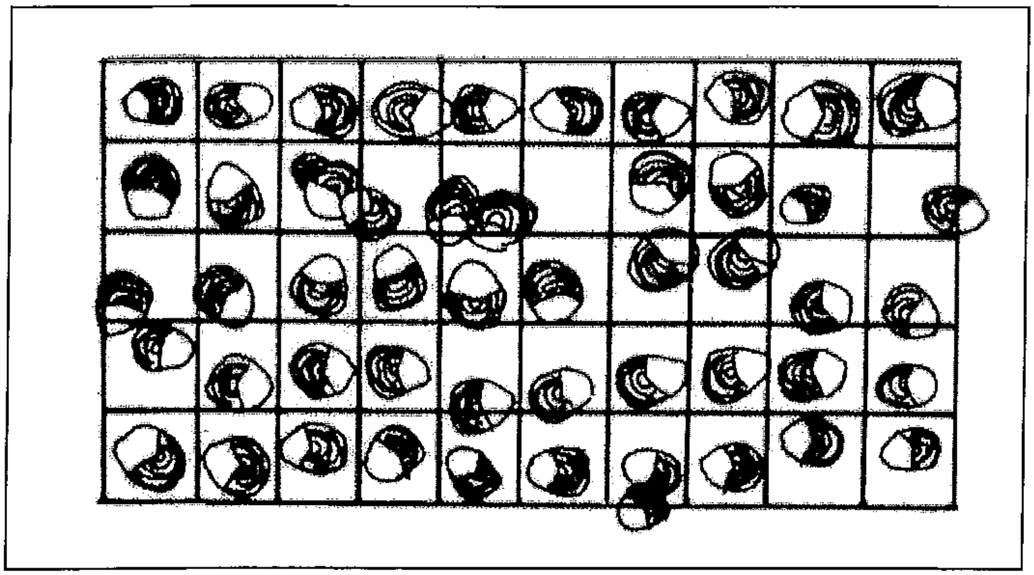




Appendix B.7. Scale orientation on the gummed card.



The scales are all correctly oriented on the card in the same direction, with the anterior portion of the scale pointed toward the top of the card.



The scales are incorrectly oriented in different directions. This increases the time spent to age samples.

Appendix C. Example of a weekly report.

To: Steve Honnold
ADF&G, Area Development Biologist
Kodiak, Alaska

Date: August 1, 1996

From: Millie Gray
ADF&G, FT-III
Kitoi Hatchery

Subject: Weekly Report

Little Kitoi Smolt Enumeration & Sampling

Pulled the fyke net trap today (8-1-96) ending the count for July 31, 1996. For the last five days there have been only sticklebacks passing through the counter. As to date this brings our estimated sockeye total to 88,925. The total sampled have been 1,116 (AWL 001 to 044). Total clips found were 515 of which 201 were right ventral, 313 were adipose/ right ventral and 1 was left ventral clip.

Little Kitoi Adult Enumeration & Sampling

Adult numbers have continued to slow down through out the week with the jack ratio remaining about the same. The overall percent of jacks is at 52%. Thus far I have found 70 marked fish. Most have been jacks, with 69 being RV and 1 LV. Lots of pinks milling around in Little Kitoi Bay with very few sockeye seen today.

Hatchery

7-30-96 Completed Chum salmon egg take with a total of approximately 30 million eggs being collected. I sampled a total of 800 fish through out the egg take.
7-30-96 The new aluminum boat was moved up into Little Kitoi Lake.

Commercial Fisheries

7-29-96 Fisheries opened in Kitoi Bay at noon and closed at 6 p.m. There was 1 tender and 2 boats fishing. A total of approximately 55,000 lbs of fish were harvested. Of those approximately 250 lbs were sockeye salmon and 50 lbs were coho salmon. I was able to collect 7 lengths and scales off sockeye.

Miscellaneous

7-31-96 Did a survey of Little Kitoi Lake to try and locate any of the sockeye. I saw 1 small jack by the outlet of the creek behind the island. I also started a survey of the middle basin (station #3) to determine at what depth the hydrogen sulfide chemocline exists.

Anticipated Activities

Monitor smolt counter at Little Kitoi.
Monitor and enumerate adult weir at Little Kitoi.
Sample adult sockeye at Little Kitoi.
Monitor the commercial fishery when opened in Kitoi Bay.
Continue with mapping of hydrogen sulfide in Little Kitoi Lake.

Appendix D. 1997 Development Section equipment storage and tracking memorandum.

InterOffice Memo

To: Development Section staff

From: Steve Honnold, Area Resource Development Biologist

Date: April 2, 1997

Subject: 1997 Development Section equipment storage and tracking

The incidence of stolen or missing ADFG and KRAA equipment used for Development Section projects has increased in recent years. This is unacceptable and in need of immediate remedy. (Please refer to the attached memorandum for background information.) This memorandum is intended to provide guidelines to alleviate the problem of missing equipment and will be implemented by all Development Section employees this season. This plan addresses equipment storage, tracking and inventory. Note that some changes have been made from the preliminary plan outlined in the attachment.

1) The equipment (rafts, outboards, batteries, misc.) that was temporarily stored at the bunkhouse was moved to the inner office at the DOT warehouse. This space was assigned to the Development Section in 1996; however, other gear is also occupying a fair amount of this assigned space. The majority of this gear is surplus equipment that will be put up for auction in the spring. Al Spalinger is the contact for this equipment which will need to be relocated before additional Development gear is moved from Devil's Creek.

2) The remainder of the Development Section equipment stored at Devils Creek will be moved by ~May 1. This gear should be sorted and stored at DOT in some logical order. The shelves should be moved first and set up in the van or inner office to provide space for organizing.

3) This year, project crew leaders will be responsible for coordinating with PJ to enable efficient tracking of equipment. A system (some type of check off list) will be developed (or modified) to track all State inventoried equipment and KRAA gear of significant value. These items will include: weatherports, generators, chainsaws, outboard engines, firearms, rafts/skiffs, radios, heaters, batteries, etc. I expect to be able to easily know the whereabouts of our equipment at any given time **(including items in the "shop" for repairs)**. None of the above mentioned type of equipment will be left in a field camp during the off season.

4) All equipment will be put in <u>locked storage</u> when in town awaiting repair or when in transition between field projects. The bunkhouse will not be used for extended storage (aside from the lockers) but may be used for staging for short periods (maximum 24 hours);.

5) The Kodiak Transfer storage unit will continue to be used this season; however, as field projects end this year, gear will be relocated to the DOT warehouse and this unit will no longer be necessary.

I expect the above outlined plan to be adhered to by all Development Section employees. Employees may be held liable for negligent losses and such incidents will be reflected in annual performance evaluations.

Let me know if you have any questions.

cc: W. Donaldson
Probasco
Malloy
Spalinger
Clevenger

Appendix E. State of Alaska Performance Evaluation Form.

Fish and Game

[redacted]

11-

REASON FOR REPORT

☐ ANNUAL ☐ RESIGNATION ☐ COMPLETION OF PROBATION

☐ OTHER (SPECIFY) ______

POSITION DESCRIPTION REVIEWED BY RATER

YES ☐ NO ☐ If no, explain:

SPECIFIC RATING AREAS

	* U	A	O
PERFORMANCE (As shown by: quantity, quality, accuracy, and completeness of work; knowledge of job fundamentals; judgment shown on the job; willingness and ability to carry out new assignments; independence of performance; attitude towards job.)	☐	☐	☐
WORK HABITS (As shown by: attendance; punctuality; appearance and grooming; safety.)	☐	☐	☐
INTERPERSONAL RELATIONSHIPS (As shown by: consideration of public and co-workers; acceptance of supervision.)	☐	☐	☐
SUPERVISORY (for Supervisory Employees Only) (As shown by: training and directing subordinates; evaluating subordinates; planning and organizing work, including delegation; problem solving and decision-making ability; affirmative action achievement; cost effectiveness; and, Labor Contract Administration).	☐	☐	☐

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* U = Unacceptable A = Acceptable O = Outstanding.

NARRATIVE SECTION

	U	Acceptable			O
Overall Effectiveness on the Job	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

(Overall Effectiveness MUST be explained. Other performance consideration, such as strong points and areas needing improvement, should be included.)

Rater's Recommended Action: ______

Rating was discussed with employee ☐ Yes ☐ No If no, explain:

Signature of Rater ______ Title ______ Date ______

Employee: ☐ Concur with Rating ☐ Disagree (Employee comments on back)

Signature ______ Date ______

REVIEWED AND APPROVED BY:

Division Signature: ______ Title ______ Date ______

Department Signature: ______ Title ______ Date ______

Rev. Jan 1996

Appendix F. Instructions to properly fill out a timesheet and an example of a timesheet.

SSN: your social security number
Name: you guessed it!
Division: Commercial Fish
Day: Monday, Tuesday, etc.
Date: 6/16, 6/17, etc.
Time: start and stop time
Code 1: fill in the number of hours worked for that day (see example).
Work hours total: should be the same number as code 1.

Totals: the code 1 and work hours total columns need to be totaled (see example). If your time sheet is sent in before the end of the pay period, project your time for the remaining days so you can total your columns.

Comments: Leave blank, this section will be filled in town.
Employee's signature and date: You know what to do there.

ALASKA DEPARTMENT OF FISH AND GAME Time and Attendance Report

Pay period ending: 3/15/00 SSN: Name: Division Commercial Fisheries

Record times in military format. Example: 6:00 p.m. = 18:00. If you work past midnight, stop at 23:59 and resume at 00:01 the next day.

Day	Date	Start	Stop	Start	Stop	Start	Stop	Start	Stop	Start	Stop	Leave Taken	Sea Duty	Standby	Hazard	Code 1	Code 2	Code 3	Code 4	Holiday / Leave	Work Hrs Total
Wed	3/1	8:00	12:00	13:00	16:30											7.50				0.00	7.50
Thu	3/2	8:00	12:00	13:00	16:30											7.50				0.00	7.50
Fri	3/3	8:00	12:00	13:00	16:30											7.50				0.00	7.50
Sat	3/4																			0.00	0.00
Sun	3/5																			0.00	0.00
Mon	3/6	8:00	12:00	13:00	16:30											7.50				0.00	7.50
Tue	3/7	8:00	12:00	13:00	16:30											7.50				0.00	7.50
Wed	3/8	8:00	12:00	13:00	16:30											7.50				0.00	7.50
Thu	3/9	8:00	12:00	13:00	16:30											7.50				0.00	7.50
Fri	3/10	8:00	12:00	13:00	16:30											7.50				0.00	7.50
Sat	3/11																			0.00	0.00
Sun	3/12																			0.00	0.00
Mon	3/13	8:00	12:00	13:00	16:30											7.50				0.00	7.50
Tue	3/14	8:00	12:00	13:00	16:30											7.50				0.00	7.50
Wed	3/15	8:00	12:00	13:00	16:30											7.50				0.00	7.50
																				0.00	0.00
TOTALS														0.00	0.00	82.50	0.00	0.00	0.00	0.00	82.50

	Charge to:		
	Notation	CC/LC	%
1		11340033/11340033	100%
2			
3			
4			
		Total	100%

	Comments		Comments
3/1		3/9	
3/2		3/10	
3/3		3/11	
3/4		3/12	
3/5		3/13	
3/6		3/14	
3/7		3/15	
3/8			

We certify that the information provided above is true and correct.

Employee's Signature Date:

Supervisor's Signature Date:

Approving Officer Signature Date:

Leave Use Codes
H=Holiday X=Comp Ann
S=Sick Y=Comp Pers
A=Annual C=Court
P=Personal L=LWOP

**** Premium Pay Codes (PPC)**
110 - Sea Duty 250 - Straight Time
208 - Hazard 251 - Overtime
211 - Standby

Holiday, Leave, Overtime and Premium Pay Overrides

**Codes	Hours	CC/LC
Leave & Holiday	0.00	No code needed for Leave & Holiday

KODIAK ISLAND
LAKE ASSESSMENT/LIMNOLOGY PROJECT
LABORATORY ANALYSIS
OPERATIONAL PLAN, 2002

by:

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Steven Honnold
Stephen Schrof
and
Kally Spalinger

Alaska Department of Fish and Game
Division of Commercial Fisheries
211 Mission Road
Kodiak, Alaska 99615

May 2002

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INTRODUCTION

The Alaska Department of Fish and Game (ADF&G) began sampling Kodiak Island lakes for limnological data in the early 1980s. Lake sampling and laboratory processing of samples were difficult to sustain by the early 1990s due to the reduction of the ADF&G budget. As a result, in 1991 the Kodiak Regional Aquaculture Association (KRAA) began funding the majority of limnology sampling and laboratory analysis in the Kodiak area. The limnology program has become an integral part of salmon enhancement, restoration, and biological monitoring projects within the Kodiak area. Over 30 Kodiak Island Archipelago lakes have been sampled for limnological data since this cooperative ADF&G/KRAA program was initiated. The limnology program is scheduled to continue in conjunction with salmon stocking, lake fertilization, and other enhancement/rehabilitation projects. The current limnology program will collect samples from 15 lakes in the Kodiak area for the 2002 field season.

Until 2000, water samples have been collected by the ADF&G staff in Kodiak and then processed and analyzed by the ADF&G, region II, Division of Commercial Fisheries Central Region Limnology program (CRL). In 2000, the ADF&G CRL staff stopped providing laboratory services for the Kodiak area. To continue the limnology program in the Kodiak area the ADF&G Near Island laboratory in Kodiak was started in 2000, collecting, processing, and analyzing water samples.

Goals

1. To assess the primary and secondary production of sockeye salmon nursery lakes in the Kodiak Archipelago as part of evaluation programs for sockeye salmon stock restoration and enhancement projects.

2. To monitor rearing habitat of selected wild stock sockeye salmon systems to maimtain productive juvenile rearing and subsequent adult production.

Objectives

1. Estimate the seasonal mean water chemistry, nutrient, and chlorophyll *a* concentrations by unit volume.

2. Estimate the seasonal mean density, biomass, and size of each of the species of macrozooplankton.

3. Estimate the compensation depth (EZD) for algal photosynthesis.

4. Determine the temperature and dissolved oxygen regimes.

Tasks

1. Collect lake water at 1 m depth at each limnology sampling station from Laura, Little Waterfall, Afognak, Lower Malina, Upper Malina, Little Kitoi, Spiridon (two stations), and Hidden Lakes (Table 1).

2. Collect one zooplankton sample at each station from Laura, Little Waterfall, Afognak, Lower Malina, Upper Malina, Little Kitoi, Spiridon (two stations), Hidden, Lower Jennifer, Ruth, Saltery, Karluk, Frazer, Crescent, and Big Waterfall Lakes using the vertical tow method (Table 1).

3. Collect upward directed light readings (Foot Candles) at each limnology station in each lake.

4. Measure dissolved oxygen (mg/l) and temperature (°C) from the lake surface to the bottom at each limnology station in each lake.

5. Measure the water clarity at each limnology station in each lake with a secchi disk.

6. Process and analyze the above mentioned water and zooplankton samples at the Near Island ADF&G Limnology Laboratory.

7. Process and analyze any additional subcontracted water and/or zooplankton samples at the Near Island ADF&G Limnology Laboratory.

SUPERVISION AND STAFFING

Project Biologist: Steven Honnold

Near Island Laboratory Manager: Steven Thomsen

Laboratory Staff: Steven Thomsen and Corine Ferre'

Assisting Personnel: Steve Schrof

The project biologist and laboratory manager are responsible for project oversight, including logistics and technical support as well as data quality control.

Field Sampling Staff: Steve Thomsen, Corine Ferre', Nick Sagalkin, Stephen Schrof, Steven Honnold, Rob Baer, Greg Watchers, Wes Ghormley (Kitoi Lakes), and Charlette Fullinck.

The field staff is responsible for scheduling air charters to sample and complete field sampling on schedule. Field staff are responsible for reviewing the department's safety Standard Operating Procedures (SOP), with emphasis on aircraft and boating safety.

SAMPLE COLECTION PROCEDURES

Water Sampling

Collect water samples monthly (May-September) from Spiridon and Hidden Lakes. Collect water samples every six weeks from Laura, Little Waterfall, Afognak, Lower and Upper Malina, and Little Kitoi Lakes (Table 1; Figure 1). Collect water samples, if needed, from sub-contracted lakes (Figures 2 to 6). The *Field Sampling Equipment List* (Appendix A) indicates all the necessary collection gear. To collect water samples use the following methods:

1. Prepare a clearly marked morphometric map showing station locations at the lake being sampled. Keep a copy of the map on file in the Kodiak office and at the Near Island laboratory.

2. Pre-clean and label all plastic carboy containers with the name of the lake, station and depth (outlined in General Laboratory Procedures).

3. Collect lake water samples at the 1 m depth at each limnology sampling station from Laura, Little Waterfall, Afognak, Lower Malina, Upper Malina, Little Kitoi, Spiridon (two stations), and Hidden Lakes. Collect a total of four samples from all lakes except from Hidden and Spiridon where five and ten water samples are collected, respectively.

4. Collect water samples using a Van Dorn sampler.

   a) Lower the sampler to the desired depth (1 m).

   b) Attach a weighted messenger to the rope. Drop the messenger down the rope to release the trip the mechanism closing the Van Dorn Bottle.

   c) Pull the sampler to the surface. Rinse the appropriate carboy with a small portion of sample water and discarded. Pour the remaining sample water into the carboy.

   d) Repeat this procedure (without rinsing) until the carboy is 2/3 to 3/4 full. Discard any samples that contain sediment and collect another sample.

   e) Record sampling depths, stations, and other appropriate comments on the *Detailed Lake Survey* (DLS) *Form* (Figure 7).

Zooplankton Sampling

Collect one zooplankton sample at each station from Laura, Little Waterfall, Afognak, Lower Malina, Upper Malina, Little Kitoi, Spiridon (two stations), Hidden, Lower Jennifer, Ruth, Saltery, Karluk, Frazer, Crescent, and Big Waterfall Lakes using the vertical tow method (Table1). To collect zooplankton samples use the following methods:

1. Pre-clean and label all 125 ml poly zooplankton bottles with the name of the lake, station, date, and depth (outlined in General Laboratory Procedures). Add 12.5 ml buffered formalin (10% of

volume) to each poly bottle and seal the lid with electrical tape to prevent the contents from leaking out.

2. Collect a zooplankton sample at each station using the vertical tow method, using a 0.2-m diameter, 153 micron mesh conical net. Prior to sampling, measure the station depth by lowering a weighted, metered line to the lake bottom. Also prior to towing, rinse the collection basin and tow net with filtered water to clean old tow sample contents or debris (clean the net and collection basin in town before departure).

3. Lower the townet into the lake at a steady rate (so that the cod-end stays below the opening of the net) until the bottom of the net is about 1 meter from the lake bottom.

4. Retrieve the net manually at a constant rate of approximately 0.5 m/sec., stopping with the rim of the net just above the surface, slowly working the contents of the tow towards the collection basin.

5. Rinse the net with filtered water from a squirt bottle from the top down to the cod-end to wash contents into the collection basin.

6. Remove the collection basin from the net and pour the contents into a 125 ml poly bottle.

7. Rinse the remaining tow contents off of the collection basin screen using the squirt bottle containing filtered water and pour into the poly bottle until full.

Light Measurement

Measure light levels at the limnology station using an electronic photometer. Only "up" measurements will be recorded. Photometers are capable of measuring both "up" and "down" measurements.

1. Record light readings (foot candles) beginning just above the lake surface (incidence), then just below the surface at 0.5 m intervals to 5 m (i.e., 0.5, 1, 1.5, ..., 5) and then every meter (5, 6, 7, etc.) thereafter until the light level is 1% of the incidence reading.

2. Record data on the Detailed Lakes Survey (DLS) form (Figure 7).

Temperature, Dissolved Oxygen, and Secchi Disk Measurements

Measure water temperature (°C) and dissolved oxygen (DO; mg/l) levels at each lake with a dissolved oxygen meter in conjunction with water and zooplankton sampling (Table 1).

1. Examine the membrane on the meter probe prior to use for air bubbles and condition (e.g., tears, folds) and replace if necessary.

2. Measure the surface temperature with a handheld thermometer to ensure that the meter is working properly.

3. Turn the meter on for 5 to 10 minutes to warm up and then calibrate as described on the back of the meter.

4. Verify the DO reading by taking the surface water temperature and referring to the chart on the back of the meter. Verify DO at each lake.

5. Measure DO readings from the surface to the bottom at 1 m intervals. During isothermic periods (spring and fall), readings will be taken at 5 to 10 m intervals.

6. Record data on the DLS form (Figure 7).

7. Record Secchi Disk (SD) transparency at each station as a measure of water clarity.

   a) Lower the SD into the water on a metered line until it disappears from view; then pull upward until it reappears.

   b) Average the two readings and record on the DLS form (Figure 7).

Note: It is best to measure light level in an open area void of obstructions (e.g. shade from the plane wing). SD depth should be measured on the shaded or lee side of the boat or plane.

NEAR ISLAND LABORATORY INTRODUCTION

The Near Island laboratory will process and analyze water samples for the following nutrients and algal pigment concentrations: Total phosphorous (TP), total filterable phosphorous (TFP), filterable reactive phosphorous (FRP), total kjeldahl nitrogen (TKN), total ammonia (TA), nitrate + nitrite, chlorophyll *a*, and phaeophytin *a*. Other nutrients that may be analyzed include reactive silicone and organic carbon. Water chemistry parameters such as pH, alkalinity, turbidity, color, calcium, magnesium, and iron may also be assessed. Zooplankton samples will be processed and analyzed for species abundance, biomass, and size.

Until 2000, the ADF&G Central Region Limnology program (CRL) using the methods described in Koenings et al. (1987) analyzed water samples. Laboratory analysis in Kodiak at the Near Island laboratory will continue to follow Koenings et. al. (1987) methods, however, several procedures have been modified to reflect new techniques and utilize available laboratory equipment. TKN analysis was adapted from Clesceri et al. (1998). Consult Koenings et al. (1987) for laboratory methods not covered in this operational plan.

GENERAL LABORATORY PROCEDURES

Safety Considerations

Many chemicals used in the laboratory require special procedures. The laboratory has all the necessary safety equipment (i.e. hoods, eye wash stations, shower, fire extinguisher, and personal protective clothing) to comply with safety regulations. Laboratory personnel need to recognize health and safety hazards.

1. Follow material safety data sheet (MSDS) procedures. MSDS sheets are on file at the laboratory for reference and contain special procedures required for the handling, storage, and use of specific chemicals. All chemicals <u>must</u> be stored according to the MSDS sheets.

2. Most chemicals <u>require</u> the use of a hood and gloves.

3. Limit reagent use and chemical disposal to the hood as much as possible (including cuvette waste).

4. Always add strong acids or bases to water. <u>Never add water to acids</u>.

De-ionized (DI) Water Preparation

Prepare DI water with a Barnstead B-Pure filtration unit with Ultrapure and pretreatment cartridges using the following methods:

1. Connect the left (when facing unit) hose to the DI water faucet (tap water can be used).

2. Place the right hose in the sink, turn on the water faucet, and allow water to flow through system for several minutes.

3. Plug in the power cord. As long as readings remain above 14.0 meg-ohm place the right hose into the DI container.

4. If the readings fall below and remain under 14.0 meg-ohm the filters need to be replaced. See the product manual for filter replacement procedures.

5. Unplug and disconnect filtration unit when finished.

Cleaning Glassware and Plastics

1. Wash all glassware and plastics with phosphate-free soap and rinse with tap water four times and again four times with DI water.

2. Never use containers that have previously contained formalin (e.g. zooplankton or smolt sample bottles) for water samples.

Acid Washing

1. Use 10% Hydrochloric acid (HCl) to clean all glassware used for TA, TP, TFP, FRP, and TKN.

2. Acid wash glassware each day before use, keeping covered at all times. Always acid wash all glassware in the hood and dispose of waste into a waste container in the hood.

Reagent Mixing

Maintain a reagent log. Mixed reagents degrade with time, changing the effectiveness of the nutrient tests. Tracking reagents age help maintain quality laboratory data.

Reagent Disposal

Maintain a chemical disposal log; laboratory procedures produce hazardous waste material. The Near Island laboratory is currently meeting all the established regulations to deal with hazardous waste. A written chemical disposal log listing all types of chemicals and volumes disposed into the fume hood drains must be maintained to adhere to these regulations.

Preparing Standards

Standards are used to produce serial dilutions (known concentrations) for water tests. Each test contains a chart giving specific serial dilutions to prepare. Accuracy is extremely important in preparing sample standards.

1. Mix the standard in a volumetric flask of the correct capacity.

2. Use weighing funnels to reduce spillage. Pour the weighing funnel contents into the appropriate volumetric flask and rinse the funnel into the volumetric flask with DI water or the appropriate dilution agent.

3. Choose a pipet with the appropriate capacity.

4. The Metler PG503-S scale measures to 0.001 not 0.00001 as some standards specify. Use the more precise measurement in parentheses if your scale allows.

Formulating Linear Equations

Serial dilutions given in each test section are measured in the spectrophotmeter at the given wave length and plotted with their corresponding concentration to produce a linear equation. Water samples (unknown concentrations) are measured simultaneously in the spectrophotometer and their corresponding value is entered into the linear equation provided by the serial dilutions to produce a concentration value. Run new serial dilutions each day a test is run. Formulate a linear equation by regressing known serial dilution concentrations against averaged absorbances (spectrophotometer measurements), and calculate the coefficent of determination (r^2) using the following procedures (Table 2, Figure 8):

1. Enter the serial dilution volume (ml) into column A and the volume of DI water (ml) added into column B in an Excel spreadsheet. These two columns added together constitute the total volume of the sample standard. Enter the known concentration value (units vary with test type) of the serial dilutions into column C.

2. Enter the sample absorbance (spectrophotometer measurement) into column D.

3. Enter a formula subtracting the averaged blank absorbances (duplicate 0.00 serial dilutions) from each of the serial dilution absorbances into column E. This subtracts absorbance associated with the addition of reagents.

4. Plot the data using a scatter plot, setting the X values to equal the adjusted sample absorbances (column E), and the Y values to equal the secondary standard concentrations (serial dilutions) in column C.

5. Choose, add a trendline, to add the linear equation and r^2 value to the graph. Caution: Do not force the values through zero. Forcing the line through zero has proven to give unsatisfactory results.

6. Calculate sample nutrient concentrations (unknown water samples) by subtracting the same averaged blank absorbance from the averaged sample nutrient absorbances, and substituting these values into the regression formula calculated by the serial dilutions.

Thawing Water Samples

Freeze the appropriate water samples if they are not to be processed within 3 days (see water sample processing). Carefully, thaw the water samples in a water bath at 20 °C before use. Overheating the sample can break chemical bonds. Completely thaw the sample because incomplete thawing will lead to increased sample variation.

Cuvette Usage

Cuvettes are small clear sample containers, which are placed in the spectrophotometer to measure absorbance. Standard rectangular (10 mm light path) cuvettes are used in tests with high concentrations of nutrients and cylindrical long path (100 mm light path) cuvettes are used in tests with low concentrations of nutrients. Cuvettes are matched to each other and need careful handling to maintain accurate readings.

1. Always wear gloves when handling cuvettes because proteins from fingers can affect light absorbance. Special soft, lint-free cleaning materials are needed to wipe clean the cuvettes.

2. Look at a bright light through the filled cuvette to check for anything left on the surface (e.g. water spots, fingerprints) that will affect the readings.

3. After recording readings, empty the cuvette contents into a chemical disposal container under the hood (contains hazardous materials). Wash the cuvette thoroughly with phosphate free soap; rinse with DI water, and acid wash. Do not brush or scrub the cuvettes because they will scratch.

Quality Assurance

To ensure precise and accurate data, quality assurance measures must be taken. Every day quality assurance includes careful attention to cleanliness (e.g. glassware, cuvettes), exact measurements when preparing or adding reagents and standards, the use of standards with every nutrient batch, and the plotting of reagent ages (Table 3, Figure 9). To check overall accuracy use blind quality control nutrient standards (available through VWR Scientific) and send duplicate water samples to independent laboratories.

SAMPLE PROCESSING PROCEDURES

Equipment Preparation

Refer to Appendix B for equipment needed to filter water samples in the lab. Use two vacuum pump apparatuses (Figure 10) with pump suction set at 15 psi to filter water samples as follows:

1. Wash the filtration equipment (i.e. filter towers, flasks) and graduated cylinders with phosphate-free soap, and then rinse with tap water four times and again four times with DI water prior to filtering (see De-ionized water section). Cover the graduated cylinders and filter towers with parafilm to keep out contaminates.

2. A vacuum pump attached to a single filtration flask (apparatus A) is used to collect one of three particulates (C, N, or **P**) and collect filtered water.

3. A vacuum pump attached to a filtration manifold (apparatus B) is used to collect the two remaining particulates (C, N, or P), and Chlorophyll *a*. Chlorophyll *a* is always collected using the same graduated cylinder, filtration apparatus (B), and tower (C).

4. Keep the pump oil reservoir level filled to the red line.

Sample Preservatives

The following sample preservatives are used to stabilize chlorophyll *a*, phytoplankton, and zooplankton, respectively.

1. Magnesium carbonate ($MgCO_3$) – Add 1 g of magnesium carbonate-n-hydrate to 100 ml of DI water. Shake well before adding to chlorophyll *a* filter tower.

2. Lugol's acetate – Add 10 g of potassium iodide, 5 g of iodine, and 5 g of sodium acetate-trihydrate to 70 ml of DI water.

3. Buffered formalin – Add ~ 10 pellets of sodium hydroxide (NaOH) to one liter of 100% formalin (37% formaldehyde) or until a pH of 7 to 8 is reached.

Water Sample Processing

Process water samples within <u>three days</u> of field sampling. Rinse Poly bottles and graduated cylinders with a small portion of sample water from each carboy. Use a graduated cylinder to measure the following subsamples for each carboy. See Appendix C for sample collection protocol and procedures for processing lake water.

Fill the following sample collection containers directly from the sample carboy.

1. Unfiltered refrigerated: Measure approximately 500 ml of sample water into a 500 ml poly bottle (fill to the top to reduce trapped air) and refrigerate.

2. Unfiltered frozen: Measure about 450 ml of sample water into a 500 ml poly bottle (leave space at the top to allow for expansion while freezing) and then freeze.

3. Phytoplankton: Measure 100 ml of unfiltered water and place into an amber 125 ml poly bottle. Add 2.0 ml Lugol's acetate, mix gently, and store in the dark at room temperature.

Using the two vacuum pump apparatuses process the following:

1. Particulates:

a) Place one sterile Whatman GF/F filter pad on the filter tower of apparatus A and three sterile Whatman GF/F filter pads on the three filtration towers of apparatus B with sterile forceps.

b) Draw 100 ml of DI water through all four filter pads and discard.

c) Rinse each of the four graduated cylinders (previously cleaned) with 200 ml of sample water and discard.

d) Pour 1000 ml of sample water into each of the four graduated cylinders and place each in front of a filtration tower. Make sure the chlorophyll *a* graduated cylinder and filtering tower is placed with each other.

e) Pour a portion of the sample from the graduated cylinder into each of the four filter towers keeping each graduated cylinder with its corresponding filtering tower. Add more sample water to each filtration tower until 1000 ml (1 L) is filtered for each of three particulates (N, P, C). All samples will be filtered through completely except the chlorophyll *a*.

f) When ~ 50 ml of the sample remains in the chlorophyll *a* filtration tower add ~5 ml of the magnesium chloride ($MgCO_3$) solution to the filtration tower to preserve the sample. Wash all three filtration towers from apparatus B with DI water to insure that all the particulates are collected on the filters. Do not wash the filtration tower from apparatus A with DI water because this would dilute the filtered water used for the filtered frozen sample.

g) Remove the particulate nutrient filter pads with forceps from the filter apparatus and place in the appropriately labeled, covered filter holder and store in the freezer.

h) Save the filtered water collected from apparatus A (2000 ml filtration flask) for the filtered frozen sample. Discard the filtered water collected from apparatus B (carboy).

2. Filtered frozen: Rinse the filtered frozen 500 ml poly bottle with a small amount of filtrate water from the filtrate flask (apparatus A) and discard. Pour approximately 450 ml of the filtrate water into the ploy bottle and store in the freezer.

SAMPLE ANALYSIS PROCEDURES

pH

Almost every chemical reaction is pH dependent, making it an important aspect of water quality. PH units are a measurement of the concentration of hydrogen ions (acidity) in a solution at a specific temperature and are important in determining alkalinity (Koenings et al. 1987).

Equipment Corning model 430 meter, 100 ml graduated cylinder, and 250ml beakers.

Reagents Buffer solutions of pH 4, 7, and 10 to calibrate the pH meter. Electrode fill solution of 3 M KCl. Store the pH electrodes in a pH 4 or 7 buffer solution.

Procedure

1. Calibrate the pH meter (Corning instruction manual, 1996).

2. Pour 100 ml of the unfiltered refrigerated water sample into a 250 ml beaker. Allow the sample to reach 20°C.

3. Pull the rubber plug from the pH probe. Immerse the pH probe into the sample and stir briefly to clear DI water from the probe. Record the measurement when equilibrium is reached. Stirring affects the pH so be sure to allow adequate time for the sample to stabilize.

4. Rinse the probe with DI water and blot dry.

5. Continue with the next sample or place the probe into the electrode storage solution.

Alkalinity

A lake's alkalinity determines its ability to resist changes in pH (Koenings et al. 1987). Many chemical reactions, such as photosynthesis, affect the pH and alkalinity (buffering capacity) and are important to the health of the lake. Alkalinity is principally due to the presence of carbonate and bicarbonate ions, which are converted to carbon dioxide at a pH of 4.5. A measure of alkalinity can determine the amount of inorganic carbon available for algal uptake.

Equipment Oakton portable pH meter, 10 ml buret, buret stand, magnetic stirrer, large magnetic stir bar, volumetric flasks, pipettes, 100 ml graduated cylinder, and 250 ml beaker.

Reagents

1. 1 N Sulfuric acid – Dilute 27.8 ml of concentrated H_2SO_4 to 1 liter with DI water. <u>Caution – Never add water to acid!</u>

2. 0.02 N Sulfuric acid – Dilute 10 ml of 1 N Sulfuric acid to 500 ml with DI water.

3. Buffer solutions of pH 4, 7, and 10 to calibrate the pH meter.

Procedure

1. Calibrate the pH meter (Corning instruction manual, 1996). Use the portable pH meter during titration because the Corning table top model reacts slowly to changes in pH.

2. Measure 100 ml of the unfiltered refrigerated water sample into a 250 ml beaker. Allow the sample to reach 20° C. Place a stir bar into the 250 ml beaker and place the beaker on a magnetic stirrer. Place the portable pH meter into the beaker with the water sample.

3. Fill the 10 ml buret with 0.02 N sulfuric acid (titrant). Slowly add titrant to the water sample, stirring to mix the sample and discontinuing stirring to stabilize the sample, while monitoring the pH. Add titrant until a pH of 4.5 is reached and record the volume (ml) of titrant used.

Calculations

$$\text{Total Alkalinity (mg L}^{-1}\text{ as CaCO}_3) = \frac{B \times N \times 50000}{V}$$

Where:

B = ml titrant
N = normality of the titrant
V = sample volume (ml)

Or: If the above procedure is followed:
Total Alkalinity = B x 10

Color

The presence of organic compounds and colloidal particles imparts color and restricts light penetration (Wetzel and Likens. 1991). Color is one component of light penetration and affects the photic depth (1% of surface illumination).

Equipment Spectronic Genesys 5 spectrophotometer and 10 mm cuvettes.

Reagents 500 Platinum cobalt unit standard supplied by Hach Chemical Company.

Procedure

1. Prepare thirteen serial dilutions of the standard using the following chart.

Volume of color standard (ml) to be added for serial dilution	Volume of De ionized (DI) water (ml) to be added for serial dilution	Known Platinum Cobalt Units (PT) at each serial dilution	Sample absorbance (400 nm) for each serial dilution
0.00	4.00	0.0	0.000
0.10	3.90	12.5	0.019
0.20	3.80	25.0	0.046
0.30	3.70	37.5	0.064
0.50	3.50	62.5	0.103
1.00	3.00	125.0	0.210
2.00	2.00	250.0	0.420
3.00	1.00	375.0	0.615
3.50	0.50	437.0	0.726
3.70	0.30	462.0	0.769
3.80	0.20	475.0	0.786
3.90	0.10	487.0	0.803
4.00	0.00	500.0	0.826

2. Measure the absorbance of the serial dilutions at 400 nm against a DI water blank in the spectrophotometer (see the spectrophotometer operational manual).

3. Plot the values in Excel and run a regression to calculate a linear formula and a r^2.

4. Measure the absorbance of duplicate filtered frozen water samples at 400 nm in the spectrophotometer against a DI water blank.

Calculations

1. Formulate a linear equation by regressing the known serial dilution concentrations against corrected absorbances, and calculate the r^2. Follow the procedures under the General Laboratory Practices Section. Refer to Figure 8 for a plot of the data above.

2. Determine the water sample concentration by substituting the corrected average sample absorbance into the regression formula provided by the serial dilutions.

Hydrogen Sulfide

Hydrogen sulfide (H_2S) is formed by anaerobic decomposition of organic material. Low pH shifts bisulfide ion (HS^{-1}) to Hydrogen sulfide, which is toxic to aquatic life in concentrations in excess of of 3 ug L^{-1}.

Equipment Van Dorn bottle, 500 ml poly bottles, 300 ml BOD bottles, Spectrophotometer, 50 ml stoppered cylinders, and 10 mm cuvettes.

Reagents

1. P-phenylenediamine-HCl – Dissolve 1 g of p-phenylenediamine into a mixture of 100 ml concentrated HCl and ~300 ml of DI water, cool, and dilute to 500 ml with DI water.

2. Ferric chloride solution – Dissolve 16.6 g of ferric chloride-6-hydrate into 100 ml of concentrated HCl. Carefully add to ~350 ml of DI water and dilute to 500 ml with DI water. <u>Caution: These reagents are very toxic!</u>

Procedure Collect Hydrogen sulfide water samples from Kitoi Lake once a year from two stations (1 and 3) at three depths (1 meter, transition zone, and 1 meter above the bottom) to monitor toxic sulfide levels. To collect dissolved gasses (ie. H_2S) lower the Van Dorn bottle to the desired depth and close the bottle with the messenger. Retrieve the Van Dorn bottle and attach a length of tubing to the outlet drain (see the operational manual). Place the tube into the bottom of the BOD bottle and open the outlet drain valve allowing the water to overflow the BOD bottle. Cap the BOD bottle without airspace.

Field water sample collection procedure:

1. Collect a water sample from each station and depth in a 300 ml BOD bottle without trapping air bubbles inside.

2. Fill a 500 ml poly bottle with a water sample from each station and depth and seal the bottle to be processed for pH.

Laboratory water sample processing:

1. Measure the pH of the water sample from each poly bottle collected in the field and record the results.

2. Label three 50 ml stoppered cylinders for each BOD sample collected and three stoppered cylinders for DI water to use as a reagent blank.

3. Pour 50 ml of sample water sample or DI water into the corresponding 50 ml stoppered cylinder, and immediately add 5 ml of the p-phenylenediamine – HCl solution and invert to mix. Process sample water and serial dilutions simultaneously.

4. Within 2 minutes, add 1 ml of the ferric chloride solution and invert to mix.

5. After 2 minutes invert again. Color development is complete within 30 minutes and is stable for days. Keep dark and cool until analyzed.

6. Measure the water sample absorbance against reagent blanks at 600 nm.

Calculations

1. Determine sample concentrations by substituting the water sample and reagent blank absorbances into the formula below. Refer to Figure 11 for a plot of the data below.

   Total Sulfide (TS) (ug L^{-1}) = As – Ab x 1,168.
   As = Sample absorbance; Ab = Blank absorbance

pH of the water sample	Proportion of H_2S as a function of pH	Proportion of HS^{-1} as a function of pH
5.0	1.00	0.00
6.0	0.90	0.10
6.4	0.80	0.20
6.6	0.70	0.30
6.8	0.60	0.40
7.1	0.50	0.50
7.2	0.40	0.60
7.4	0.30	0.70
7.6	0.20	0.80
8.0	0.10	0.90
9.0	0.00	1.00

2. Determine if toxic levels of H_2S are in the water sample by multiplying TS by the numerical proportion of H_2S given in the table above at the corresponding pH of the water sample.

Total Ammonia (TA)

Lake nitrogen includes organic nitogen, ammonium (NH_4^+), ammonia (NH_3), nitrite (NO_2^-), and nitrate (NO_3^-) (Koenings et al. 1987). Phytoplankton utilize inorganic nitrogen, but prefer ammonium and ammonia. The Total Ammonia test determines ammonium and ammonia concentration.

Equipment Spectronic Genesys 5 Spectrophotometer, 50 ml stoppered cylinders, and 100 mm cuvetts.

Reagents

1. Phenol – Dissolve 12.5 g of phenol into ~50 ml of reagent alcohol, and dilute to 125 ml with reagent alcohol. <u>This reagent must be replaced weekly!</u>
   <u>Caution: This reagent is toxic!</u>

2. Ferrocyanide solution – Dissolve 1.55 g of potassium ferrocyanide-trihydrate into ~200 ml of DI water, and dilute to 250 ml. This reagent has a 1 month shelf life.

3. Hypochlorite solution – Dissolve 80 g of sodium citrate-trihydrate and 4 g of sodium hydroxide into ~300 ml of DI water. Add 100 ml of Clorox (5% sodium hypochlorite), and dilute to 500 ml with DI water. *Caution:* Ultra Clorox is more concentrated than standard Clorox. This reagent and the opened Clorox have a two-month shelf life.

Standards

1. Primary nitrogen standard (0.2 mg ml^{-1} N) – Dissolve 0.382 g (0.3824 g) of ammonium chloride (NH_4Cl) into ~400 ml of DI water, and dilute to 500 ml. Note: the current Metler scale only measures to 0.001. *Be sure and use a volumetric flask!*

2. Secondary standard (0.5 ug ml^{-1} N) – Dilute 0.25 ml of the primary standard to 100 ml.

Procedure Add the three reagents in steps 3 through 5 to the stoppered cylinders in groups of three to stagger color development, allowing for proper processing time.

1. Label two 50 ml stoppered cylinders (SC) for each water sample, two SC for 0.0 serial dilutions (DI water blanks), and one SC for each of the five remaining serial dilutions listed in the chart below. Run serial dilutions each day samples are processed.

2. Pour 50 ml of the filtered frozen water sample or serial dilution into an acid washed 50 ml stoppered cylinder. Process sample water and serial dilutions simultaneously.

3. Add 2 ml of phenol and invert to mix. Caution: This reagent is very toxic!

4. Add 2 ml of potassium ferrocyanide and invert to mix.

5. Add 5 ml of the hypochlorite solution, invert twice to mix, and invert again after 15 minutes.

6. Allow exactly 2 hours for full color development. Readings are time dependent. Measure the serial dilution and water sample absorbances against a DI water blank at 640 nm.

Calculations

1. Formulate a linear equation by regressing the known serial dilution concentrations against corrected absorbances, and calculate the r^2. Follow the procedures under the General Laboratory Practices section. Refer to Figure 12 for a plot of the data below.

2. Determine the water sample concentration by substituting the corrected average sample absorbance into the regression formula provided by the serial dilutions.

Volume of secondary nitrogen standard (ml) to be added for serial dilution	Volume of DI water to be added for serial dilution (ml)	Known ammonia concentration (ug mL) at each serial dilution	Sample Absorbance (x) for each serial dilution	Corrected absorbance(x-blank)
0.0	50.0	0	0.036	0.000
0.1	49.9	1	0.053	0.017
0.3	49.7	3	0.058	0.022
0.5	49.5	5	0.066	0.030
1.5	48.5	15	0.127	0.091
5.0	45.0	40	0.299	0.263

Nitrate and Nitrite

Nitrite (NO_2^-) is oxidized to Nitrate (NO_3^-) by nitrification and utilized for photosynthesis in oligotrophic systems (Koenings et al. 1987). Low oxygen concentrations in eutrophic systems can fuel denitrification ($NO_3^- \rightarrow NO_2^- \rightarrow NH_3$). This method determines nitrate + nitrite concentrations by reducing nitrate to nitrite with cupric sulfate. Nitrite concentrations can be calculated by adding the reagents and not passing the water sample through the cadmium reduction columns, eliminating the reduction step.

Equipment Spectronic Genesys 5 Spectrophotometer, 80 ml cadmium reduction columns (Figure 13), 50 ml stoppered cylinders, and 100 mm cuvettes (10 mm cuvettes can be used but are less accurate).

Reagents

1. Buffer solution – Dissolve 100 g of ammonium chloride, 20 g of sodium borate-10-hydrate, and 1 g of Na-EDTA in ~ 750 ml of DI water, and dilute to 1 liter with DI water.

2. Sulfanilamide – Dissolve 3 g of sulfanilamide in 150 ml of DI water and 50 ml of concentrated HCl, and dilute to 250 ml with DI water.

3. NNED – Dissolve 0.12 g of N-1 naphthylethylenediamine dihydrochloride in ~50 ml of DI water, and dilute to 100 ml with DI water. Keep in a dark bottle and replace monthly or when a brown coloration develops.

4. Cupric Sulfate – Dissolve 25 g of cupric-sulfate 5-hydrate in ~400 ml of DI water and dilute to 500 ml with DI water.

5. 10% Hydrochloric acid – Slowly add 5 ml of concentrated HCl to 45 ml of DI water.

6. Cadmium – 40 to 60 mesh granules (comes already sized).

Standards

1. Primary nitrate standard (0.1 mg ml^{-1} N) – Dissolve 0.361 g (0.36101 g) of potassium nitrate in ~ 400 ml of DI water, and dilute to 500 ml with DI water.

2. Secondary nitrate standard (1 ug ml^{-1} N) – Dilute 2.5 ml of the primary standard to 250 ml with DI water.

3. Primary nitrite standard (0.1 mg ml^{-1} N) – Dissolve 0.246 g (0.24630 g) of sodium nitrite in ~ 400 ml of DI water, and dilute to 500 ml with DI water.

4. Secondary nitrite standard (1 ug ml^{-1} N) – Dilute 1.0 ml of the primary standard to 100 ml with DI water.

Procedure Test the reduction efficiencies (RE) of each of the cadmium columns at the start of the season and mid season following step 9. If the RE is less than 95% or greater than 105% clean and repack the cadmium columns following step 10. Start at step 1 when the cadmium columns are operating properly.

1. Label two 50 ml stoppered cylinders (SC) for each water sample. When checking the RE, label two SC for 0.0 serial dilutions (DI water blanks) and one SC for each of the four remaining serial dilutions listed in the chart below.

2. Pour 50 ml of the filtered frozen water sample or serial dilution (only when checking the RE) into a 50 ml stoppered cylinder, add 5 ml of buffer solution and invert to mix.

3. Pour ~ 20 ml of buffered sample into the column reservoir, allow the sample to drip through, and discard the effluent.

4. Pour the remaining sample (~35 ml) into the column reservoir and collect 30 ml of the effluent in the original cylinder. Allow the remaining sample (~5 ml) to drip through, and discard.

5. If columns have less than 18.5 cm of cadmium pass a 50 ml buffered blank through the columns between sample sets to compensate for residual nitrogen left in the column.

6. Add 0.5 ml of sulfanilamide to the 30 ml sample, and invert twice to mix. Let sit for 5 minutes.

7. Add 0.5 ml of NNED solution and invert twice to mix. Allow 15 minutes for full color development. The color remains stable for hours.

8. Measure the serial dilution and/or sample absorbance against a DI water blank at 543 nm.

9. Check the reduction efficiencies (RE) of each with the following procedure.

   a) Prepare a reagent blank by adding 5 ml of buffer solution to 50 ml of DI water in a stoppered cylinder and invert to mix.
   b) Prepare two nitrate standards by adding 10 ml of the secondary nitrate standard to each of two stoppered cylinders, dilute each to 50 ml with DI water, and add 5 ml of buffer to each. Invert to mix.
   c) Prepare a nitrite standard by adding 10 ml of the secondary nitrite standard to a stoppered cylinder, dilute to 50 ml with DI water, and add 5 ml of buffer. Invert to mix.
   d) Pour the standards through the cadmium column using procedures 2 through 8 in the following order; blank, nitrate, nitrite, and nitrate.
   e) Calculate the reduction efficiency of the column as follows:

$$\text{R.E.} = \frac{\text{(averaged absorbances of nitrate standards)} - \text{blank}}{\text{(absorbance of nitrite standard)} - \text{blank}}$$

10. If the RE is less than 95% or greater than 105% clean and repack the cadmium columns.

    a) Remove the cadmium granules by inverting the column into a 600 ml beaker and rinsing with DI water.
    b) Add 50 ml of 10% HCl to the cadmium, swirl, and soak for ~ 30 minutes.
    c) Rinse the cadmium with DI water, add ~30 ml of cupric sulfate, and soak for 15 minutes.
    d) Pour off the solution, rinse the cadmium with DI water, and add 30 ml of cupric sulfate. Soak until the cadmium is coated with copper; i.e., when the blue color disappears. Rinse the cadmium thoroughly with DI water.
    e) After cleaning the columns thoroughly, close the outlet valve, and fill the column with DI water. Place a small wad of glass fiber wool into the reservoir and allow it to settle to the bottom of the column (Figure 13).
    f) Using a DI wash bottle, rinse the cadmium into the column so that the granules do not bypass the glass wool and the column is not obstructed with air bubbles.
    g) Recheck the RE.

h) Hint: The height (volume) of cadmium within a column greatly affects RE and flow rate. A height of less than 18.5 cm reduces flow rates and leaves residual sample in the column contaminating the next sample, reducing RE.
Caution: Cadmium is toxic. Do not inhale dust.

Calculations

1. Formulate a linear equation by regressing the known serial dilution concentrations against corrected absorbances, and calculate the r^2. Follow the procedures under the General Laboratory Practices section. Refer to Figure 14 for a plot of the data below.

2. Determine the water sample concentration by substituting the corrected average sample absorbance into the regression formula provided by the serial dilutions. The spectrophotometer absorbance reaches a maximum reading of 3.400 nm. For nitrate concentrations greater than 100 ug L^{-1} water samples must be diluted.

   Hint: When the columns are not in immediate use, pour ~100 ml of DI water into the reservoir and allow the water to drip through. Follow the DI water with 50 ml of buffer and allow to drip through. Keep the reservoir covered with parafilm at all times.

Volume of secondary nitrate standard (ml) to be added for serial dilution	Volume of DI water to be added for serial dilution (ml)	Known nitrogen concentration (ug L^{-1} N) at each serial dilution	Sample absorbance (x) for each serial dilution	Corrected absorbance (x-blank)
0.0	50.0	0	0.025	0.000
0.1	49.9	2	0.073	0.048
1.0	49.0	20	0.579	0.554
2.5	47.5	50	1.519	1.494
10.0	40.0	100	3.290	3.265

Total Phosphorous (TP) and Total Filterable Phosphorous (TFP)

Phosphorous concentrations in aquatic systems are typically low and can limit production (Koerings et al. 1987). N:P ratios > 18:1 are favorable for algae growth. Concentrations in our systems average 9 ug L^{-1} TP and 3 ug L^{-1} TFP.

Equipment Genesys 5 Spectrophotometer, autoclave (121^0 C, 15 psi), 50 ml volumetric flasks, 50 ml stoppered cylinders, and 100 mm cuvettes (quartz recommended).

Reagents

1. Antimony-tartrate solution – Add 53.3 ml of concentrated sulfuric acid to ~800 ml of DI water and cool. Dissolve 0.748 g of antimony potassium tartrate trihydrate in the sulfuric acid solution and dilute to 1 liter with DI water. Filter the solution when a precipitate forms. Store refrigerated and replace every two months.

2. Molybdate solution – Dissolve 7.95 g of ammonium molybdate-4-hydrate in ~500 ml of DI water and dilute to 1 liter with DI water. Store refrigerated and replace every two months.

3. 3.6 N Sulfuric acid (H_2SO_4) – Add 12.5 ml of concentrated sulfuric acid to ~ 100 ml of DI water, cool, and dilute to 125 ml with DI water.

4. Digestion reagent – Dissolve 30 g of potassium persulfate in ~400 ml of DI water containing 50 ml of 3.6 N sulfuric acid and dilute to 500 ml with DI water. Caution when pipeting: this reagent contains sediment, which increases readings. Replace this reagent weekly.

5. Mixed reagents I (MRI) – Combine 125 ml of both the antimony-tartrate and molybdate solutions. Add 1 g of ascorbic acid, dissolve, and dilute to 500 ml with DI water. Replace this reagent weekly.

Standards

1. Primary phosphorous standard (0.05 mg ml^{-1} P) – Dissolve 0.139 g (0.1389 g) of potassium phosphate-dibasic (K_2HPO_4) in ~ 400 ml of DI water and dilute to 500 ml with DI water.

2. Secondary standard (0.5 ug ml^{-1} P) – Dilute 1 ml of the primary standard to 100 ml with DI water.

Procedure

1. Label two acid washed 50 ml volumetric flasks (VF) for each water sample, two acid washed VF for 0.0 serial dilutions (DI water blanks), and one acid washed VF for each of the 5 remaining serial dilutions listed in the chart below. Run serial dilutions each day samples are processed.

2. Pour 25 ml of unfiltered frozen water sample for TP, or 25 ml of filtered frozen water sample for TFP, or 25 ml of serial dilution into a 50 ml volumetric flask. Process water samples and serial dilutions simultaneously.

3. Add 5 ml of digestion reagent and mix. Cover the volumetric flasks with aluminum foil and digest in the autoclave for 30 minutes. Follow the autoclave procedure below.

   a) Leave the temperature setting on low and set the autoclave timer to 50 minutes to allow for the slow cooling cycle.

   b) Fill the water reservoir with distilled water.

   c) Turn on the power and the slow exhaust switches.

   d) When the timer sounds, slowly crack open the autoclave door to allow venting.

   e) After ~10 minutes remove the samples.

4. Cool the samples to room temperature. Add 5 ml of MRI and mix. Add the reagent to the volumetric flasks in groups of three to stagger color development, allowing for proper processing time.

5. Allow exactly 20 minutes for full color development. Readings are time dependent. Measure the serial dilution and water sample absorbance against a DI water blank at 882 nm.

Calculations

1. Formulate a linear equation by regressing the known serial dilution concentrations against corrected absorbances and calculate the r^2. Follow the procedures under the General Laboratory Practices section. Refer to Figure 15 for a plot of the data below.

2. Determine the water sample concentration by substituting the corrected average sample absorbance into the regression formula provided by the serial dilutions.

Volume of secondary phosphorous standard (ml) to be added for serial dilution	Volume of DI water to be added for serial dilution (ml)	Known phosphorous concentration (ug L-1 N) at each serial dilution	Sample absorbance (x) for each serial dilution	Corrected absorbance (x-blank)
0.00	25.0	0	0.032	0.000
0.10	24.9	2	0.046	0.014
0.20	24.8	4	0.056	0.024
0.30	24.7	6	0.086	0.054
0.50	24.5	10	0.086	0.054
1.00	24.0	20	0.128	0.096

Filterable Reactive Phosphorous (FRP)

Algae readily take up filterable reactive phosphorous, commonly called soluble inorganic orthophosphate (Koenings et al. 1987).

Equipment Spectronic Genesys Spectrophotometer, 50 ml stoppered cylinders, 100 mm cuvetts (quartz recommended).

Reagents

1. Prepare reagents 1 through 3 as described in the TP and TFP methods.

2. Mixed reagent II (MRII) – Combine in order, 125 ml of molybdate solution, 50 ml of 3.6 N Sulfuric acid, and 125 ml of antimony-tartrate solution. Add 1.0 g of ascorbic acid, allow the solution to dissolve, and dilute to 500 ml with DI water. Replace this reagent weekly.

Standards Prepare the primary and secondary standards as described in the TP and TFP methods.

Procedure

1. Label two acid washed 50 ml stoppered cylinders (SC) for each water sample, two acid washed SC for 0.0 serial dilutions (DI water blanks), and one acid washed SC for each of the five remaining serial dilutions listed in the chart below. Run serial dilutions each day samples are processed.

2. Pour 25 ml of filtered frozen water sample or 25 ml of serial dilution into an acid washed 50 ml stoppered cylinder. Process sample water and serial dilutions simultaneously.

3. Add 5 ml of MRII, and mix. Add the reagent to the volumetric flasks in groups of three to stagger color development, allowing for proper processing time.

4. Allow exactly 20 minutes for full color development. Readings are time dependent. Measure the serial dilution and water sample absorbance against a DI water blank at 882 nm.

Calculations

1. Formulate a linear equation by regressing the known serial dilution concentrations against corrected absorbances, and calculate the r^2. Follow the procedures under the General Laboratory Practices section. Refer to Figure 16 for a plot of the data below.

2. Determine the water sample concentration by substituting the corrected sample absorbance into the regression formula provided by the serial dilutions.

Volume of secondary phosphorous standard (ml) to be added for serial dilution	Volume of DI water to be added for serial dilution (ml)	Known phosporous concentration (ug L-1) at each serial dilution	Sample absorbance (x) for each serial dilution	Corrected absorbance (x-blank)
0.00	25.00	0	0.0065	0.0000
0.05	24.95	1	0.0130	0.0065
0.10	24.90	2	0.0180	0.0115
0.20	24.80	4	0.0290	0.0225
0.30	24.70	6	0.0470	0.0405
0.50	24.50	10	0.0710	0.0645

Total Kjeldahl Nitrogen (TKN)

The Near Island Laboratory uses the Macro-Kjeldahl/Phenate methods described in Clesceri et al. (1998), converting nitrogen to ammonia. TKN determines the concentration of organic nitrogen and total ammonia. Nitrogen occasionally limits plant production.

Equipment Spectronic Genesys 5 spectrophotometer, 50 ml stoppered cylinders, 100 mm cuvettes, Ful Kontrol flask heater, Thomas 7052-J10 Micro Kjeldahl distilling apparatus (Figure 17), 800 ml Kjeldahl flasks, flask stand, 600 ml beakers, and glass boiling beads.

Reagents

1. Digestion reagent – We have chosen to add these compounds directly to the sample in place of mixing this reagent (see procedure 1). Dissolve 134 g potassium sulfate and 7.3 g cupric sulfate in ~ 800 ml DI water. Carefully add 134 ml concentrated sulfuric acid. Cool and dilute to 1 liter with DI water.

2. Sodium hydroxide-sodium thiosulfate reagent – Dissolve 250 g sodium hydroxide in ~ 400 ml DI water. Add 12.5 g sodium thiosulfate and dilute to 500 ml with DI water. *Caution*: Sodium hydroxide reacts violently with water so add the sodium hydroxide in small amounts and allow the reagent to cool.

3. 0.04 N sulfuric acid – Dilute 1.0 ml concentrated sulfuric acid to 1 liter with DI water.

4. Prepare reagents 1 through 3 as described in the TA methods.

Standards Prepare the primary and secondary standards as described in the TA methods.

Procedure

1. Pour 400 ml of the unfiltered water sample or serial dilution into an acid washed 800 ml Kjeldahl flask then add 8.9 ml concentrated sulfuric acid, 8.9 g potassium sulfate, 0.487 g cupric sulfate, and 12 boiling beads to the flask. Follow the serial dilutions listed in the Calculations section bellow using the secondary nitrogen standard described in the TA methods.

2. Place the Kjeldahl flask on the digestion unit, place the rubber stopper with glass tubing on the flask (prevents acid splashing), and start the heater unit on a setting of 100. Turn down to a setting of 30 when boiling starts.

3. Heat the sample until a volume of ~ 50 ml is reached (over-boiling will turn the sample into a solid). The procedure will take more than an hour. White fumes will be observed and the sample should become transparent.

4. Let the sample cool to room temperature.

5. Add DI water to bring the volume back to 400 ml.

6. Add 50 ml sodium hydroxide-thiosulfate reagent. Mix very gently.

7. Fill the distillation unit reservoir with 1 liter DI water (to the tape). Turn on the fume hood water valve to circulate water in the condenser unit (Figure 17).

8. Fill an acid washed 400 ml beaker with 50 ml of 0.04 N sulfuric acid and place the beaker under the condenser tip. Make sure the condenser tip is submerged in the acid.

9. Fill an acid washed 100 ml graduated cylinder with 62.5 ml of the digested water sample or serial dilution. The distillation funnel only holds ~25 ml of sample, requiring the stopcock valve to be opened to add the 62.5 ml to the distillation chamber. Close the stopcock valve.

10. Turn on the distillation unit switch and rotate the temperature setting to 140. When boiling occurs in the distillation chamber turn the temperature setting down to 80. Distill for ~ 30 minutes or until ~ 50 ml of distillate is collected.

11. Lower the 400 ml beaker from the condenser tip (Don't forget! – or the sample will be sucked back into the chamber). Turn off the distillation unit and flush out the sample from the distillation chamber as follows:

    a) Open the funnel stopcock valve and fill the distillation chamber with DI water (while the unit is still hot) and close the stopcock valve. Heat in the unit will flush the DI water into the outer chamber.
    b) Drain the outer chamber by opening the lower stopcock valve.
    c) Close the lower stopcock valve.
    d) Repeat as needed until the chamber is clean. When the unit cools flushing will not occur.

12. Cool the distillation unit (allow ~ 30 minutes or the sample will flush out of the chamber) or follow procedure (a) through (f) exactly (no cooling is required if procedure (a) through (f) is followed exactly).

    a) Pull the rubber plug from the water reservoir chamber.
    b) Refill the water reservoir chamber with DI water, leaving the plug out.
    c) Open both stopcock valves, draining the outer distillation chamber. Leave both stopcock valves open.
    d) Pour 50 ml of sample into the distillation funnel.
    e) Turn on the heating unit and put in the rubber plug.
    f) Close the lower stopcock valve
    g) After ~ 1 minute, close the upper stockcock valve (if the sample climbs the inner tubing open the valve again).
    h) Lift the 450 ml beaker so the condenser tip is covered.

13. Add another 62.5 ml of the digested water sample or serial dilution to the distillation chamber as in step 9. Repeat steps 10 and 11 collecting another 50 ml of distillate (100 ml total).

14. Repeat step 13 until a total of 250 ml is collected.

15. Flush the distillation chamber by following step 11. Clean the distillation chamber by distilling DI water through the unit. Drain the outer chamber.

16. Follow the TA procedures to determine sample concentrations.

    Hints: This method requires a full day to process two samples. The sample distillate can be stored in the refrigerator for ~ 7 days or frozen for ~28 days and processed when more samples have been distilled. All TKN samples must be analyzed with reagents of the same age due to degradation of the reagents. TKN samples can be processed with TA samples, just add more concentrated secondary standards (10.0 and 20.0).

Calculation

1. Formulate a linear equation by regressing known serial dilutions concentrations against corrected absorbances and calculate the r^2. Follow the procedures under the General Laboratory Practices section. Refer to figure 18 for a plot of the data below.

2. Determine the water sample concentration by substituting the corrected average sample absorbance into the regression formula provided by the serial dilutions. Adjustments must be made to correct for dilutions and additions of reagents.

Volume of secondary nitrogen standard (ml) to be added for serial dilution	Volume of DI water to be added for serial dilution (ml)	Known nitrogen concentration (ug mL-1) at each serial dilution	Sample absorbance (x) for each serial dilution	Corrected absorbance (x-blank)
000.0	400.0	000.0	0.014	
004.0	396.0	005.0	0.020	0.006
012.0	388.0	015.0	0.038	0.024
050.0	350.0	062.5	0.202	0.188
100.0	300.0	125.0	0.411	0.397
200.0	200.0	250.0	0.800	0.786

Chlorophyll a and Phaeophytin a

Primary production can be estimated by calculating the concentration of phytoplankton chlorophyll pigments in a volume of water (Edmonson 1959). Chlorophyll *a* is the largest component of chlorophyll algal pigments. Degradation of chlorophyll results in phaeophytin *a* (Lind 1985).

Equipment Genisis 5 Spectrophotometer, grinding vessel (ceramic mortar and pestle), Clay-Adams Dynac centrifuge, 15 ml glass centrifuge tubes, and 10 mm cuvettes (quartz recommended).

Reagents

1. 1 N Sodium bicarbonate – Dissolve and dilute 8.4 g $NaHCO_3$ into 100 ml DI water.

2. 2 N HCl – Dilute 42 ml of concentrated HCl to 250 ml with DI water.

3. 90% neutralized acetone – Dilute 900 ml of reagent-grade acetone to 1 liter with DI water, add 1 ml of 1 N $NaHCO_3$, and filter (filter in the hood).

Procedure

1. Partially thaw filter pads, place into mortar, and add ~2 ml of 90% acetone.

   Hints: Keep the samples dark and as cold as possible throughout the procedure. Storing the mortar in the freezer helps keep the samples cold. Avoid washing glassware with 10% HCl, use 90% acetone. Keep all acetone in the hood!

2. Grind the filter pad into a slurry.

3. Scrape the slurry into a 15 ml centrifuge tube, rinse the mortar and pestle with ~ 4 ml of 90% acetone and add the contents to the centrifuge tube. Rinse the mortar and pestle again with ~ ml of 90% acetone, and add the contents to the centrifuge tube. All centrifuge tubes should be filled to the same level to balance the centrifuge.

4. Cover the centrifuge tube with a cap, and refrigerate the samples for 2-3 hours to complete chlorophyll *a* extraction.

5. Centrifuge the tubes for 40 minutes at 2500 rpm. Decant the supernatant into another 15 ml centrifuge tube and dilute to 12 ml with 90% acetone.

6. Invert to mix, split equally into two centrifuge tubes, and to one tube add 0.05 ml of 2 N HCl. Invert to mix the acidified centrifuge tube.

7. Measure the absorbance of the unacidified fraction against a 90% acetone blank at 750 nm, 665 nm, 663 nm, 645 nm, and 630 nm.

8. Measure the absorbance of the acidified fraction against a 90% acetone blank at 750 nm, and 665 nm.

Calculations (Monochromatic method)

$$\text{chlorophyll } a \text{ (ug L}^{-1}) = \frac{26.7\,(665_o - 665_a) \times Vs}{L \times Vf}$$

$$\text{phaeophytin } a \text{ (ug L}^{-1}) = \frac{26.7\,(1.7\,(665_a) - 665_o) \times Vs}{L \times Vf}$$

(665_o) = absorbance 665 nm – absorbance 750 nm (before acidification).
(665_a) = absorbance 665 nm – absorbance 750 nm (after acidification).

Vs	= total volume (ml) of sample extract (12 ml normally).
L	= path length (cm) of cuvette.
Vf	= volume (L) of lake water filtered

Zooplankton

The zooplankton community is the primary forage base for juvenile sockeye salmon and therefore its characteristics are important in gauging rearing conditions and evaluating results of stocking or enrichment programs (Koenings et al. 1987). Salmon fry exert predation pressure that can structure the zooplankton community; although environmental conditions also play a role in community structure (Lind 1985).

General Preparation

Equipment Microscope with ocular micrometer, Sedgewick-Rafter counting cell (S-R Cell), 1 ml pipet (Henson-Stemple preferred), small funnel, section of plankton net large enough to fit in funnel, magnetic stirrer, and 250 ml beaker.

Procedure

1. Place a section of plankton net onto a funnel over a formalin waste container and empty the contents of the sample bottle onto the net. Rinse the sample bottle several times with DI or tap water and pour onto the net.

2. Invert the net over a 250 ml beaker and rinse the contents into the beaker using a <u>known volume</u> of DI water. Zooplankters are now formalin free and can be diluted as needed.

3. Dilute the contents of the beaker to ~100-150 organisms per ml. Do a quick count in a Sedgewick-Rafter (S-R) cell if uncertain as to organism density in the beaker. Be sure to empty the cell contents back into the beaker. Add more water if needed, recording the final volume.

4. Keep the sample evenly mixed with a magnetic stirrer and draw out a random 1 ml sample. Place the sample onto a clean S-R cell with a cover slip.

5. Using the microscope, identify, measure, and count the zooplankters present on the slide (subsections for each of the parameters follow). Count at least 3 of the 1 ml aliquots.

6. Hints: Counts from the 3 aliquots should be similar. Counting additional subsamples if counts vary. Lines on the S-R counting cells are used to facilitate systematic counting. Additional counts may be necessary to achieve consistency if the aliquots contain less than 100-150 zooplankters. To store a sample, replace the water with 10% neutralized formalin.

Identification

Common Cladocerans in Alaskan lakes are *Bosmina, Daphnia, Holopedium, Chydorus,* and *Polyphemus*. Common copepods (Copepoda) include *Cyclops, Diaptomus, and Epischura*, and some common rotifers are *Kellicottia, Asplanchna, Keratella, Conochiliodes,* and *Filinia.* Table 4 shows a list of common organisms.

Edmonson (1959) is our principle reference for zooplankton identification. Drawings of the most common Cladocerans and Copepods are shown in Figure 19. These two groups of zooplankton are the key species we identify. Our lab also identifies other miscellaneous species such as rotifers, ostracods, oligochaetes, and insects. Additional useful references for invertebrate identification include Sherman and Sherman (1976) and Smith (1977). For insect identification we use McCafferty (1983).

Differentiation between Cladocerans and copepods is fairly easy. Cladocerans are unsegmented and round in shape, with branching antennae. Copepods are segmented and long without branching antennae.

Differentiation among Cladocerans is fairly easy. Identify Cladocerans to species groups when possible. The gelatinous mass around *Holopedium* is rarely visible. Each species is counted and measured separately. Ovigerous (ovig) Cladocerans are counted and measured separately. Ovigerous Cladocerans store eggs in a brood pouch within the body and they are visible as darker structures. There may be Cladocerans that have hatched from the brood pouch, but are not identifiable yet. Record these separately as immature Cladocerans. Make certain all zooplankton readers are consistent with this identification.

Differentiation among copepods can be difficult. Each species is counted and measured separately. Egg bearing copepods are counted and measured separately. Ovigerous Cyclopoids will have one egg sack on each side of their body, towards the tail end. Ovigerous Calanoids will have one egg sack centrally located towards the tail end. Early life stage copepods are called nauplii. Nauplii have not matured enough to allow for differentiation between species groups (Figure 20). Nauplii are counted separately, but not measured.

Miscellaneous species are counted but not measured. If new species are encountered, count them and add to the templates (Appendix E, F, G, and H).

Measurements

1. Calibrate the ocular micrometer for appropriate scale and determine if any conversions are necessary.

2. Measure the distance from the top of the head to the end of the carapace (Figure 19) for the first 15 individuals of each copepod or Cladoceran species encountered. Remember to separately measure ovigerous individuals. Immature Cladocerans and nauplii do not need to be measured. Record lengths to the nearest 0.01 mm if possible.

3. Determine the required number of organisms to measure results in a level of precision of ±10% at a 95% confidence level. Template 1 (Appendix D) and Table 5 are used to give the number of measurements needed.

   <u>Sample size determination for body size (Template 1)</u>

   a) Enter organism, lake, and date.
   b) Enter the first 15 measurements taken.
   c) Mean and standard deviation (S.D.) are automatically computed.
   d) Using n, n-1 is automatically computed.
   e) Using n-1 find the corresponding t-statistic from Table 5 and enter it in the correct cell.
   f) This will give you N, which is the number of organisms that should be measured from that sample if possible.

   <u>Template 1 calculates:</u>

   g) The mean length (L) and standard deviation (SD) of the first 15 zooplankters of a species, and determines n by substituting into the formula:

      $n=[(1.96 \times SD)/(0.10 \times L)]^2$

   h) Determine the number (N) of zooplankters to be measured by using n-1 and the t-statistic at a confidence level of 95% (Table 5) and substituting t, SD, and L into the formula:

      $N=[(t \times SD)/(0.10 \times L)]^2$
      N=number to be measured

4. Record the length measurements on the Zooplankton Data Sheet (Appendix E).

Counting

1. Systematically count how many organisms of each type or category are present on the S-R counting cell. The entire cell should be counted for accurate and consistent results. Enter the counts on the Zooplankton Data Sheet (Appendix E). Count a minimum of three sample aliquots.

2. Template 2 (Appendix F) is used for count and measurement calculations.

   <u>Count data (Template 2)</u>

   If an organism is not listed, insert a new row for it. Make sure you also insert rows for the organism on all other sheets to facilitate copying and pasting. If you have more or less counts, just insert or delete columns accordingly. Mean column: Check to ensure that all counts are considered in the mean.

a) Enter sample data (lake, station, depth, date) into column B.

b) Enter dilution amount.

c) Enter the results of each count into the appropriate column.

d) Total in sample column: This should be the mean multiplied by the dilution factor.

e) #/m^2: This is the total in sample divided by the area of the plankton net opening. Make sure the area is correct for the plankton net used for that tow.

f) #/m^3: This is the total in sample divided by the product of the depth of tow and the area of the plankton net opening.

$$\text{Zooplankter per m}^2 = \frac{\text{\# in entire sample}}{\text{Net area (m}^2\text{)}}$$

$$\text{Zooplankter per m}^3 = \frac{\text{\# in entire sample}}{\text{Depth (m) of tow x net area (m}^2\text{)}}$$

3. Transfer the #/m^2 and mean body size data from Template 2 to Template 3 (Appendix G).

4. Transfer the #/m^3 and mean body size data from Template 2 to Template 4 (Appendix H). The mean body size is identical for both of these entries.

Body size and biomass sections (Template 3)

a) It will probably be easiest to transfer mean lengths one at a time from the count data sheet, but if your program has a transpose function, you can arrange organisms accordingly.

b) Make sure you have the correct length for each organism. Do not enter zero into a cell. If you have no measurement leave the cell blank.

c) Mean length is automatically calculated after each new entry. Make sure all data is considered.

d) Weighted mean length: Look at the formula closely. It is difficult to explain, but important to be familiar with so that you can recognize if there is an error. The formula uses the mean body size of an organism combined with how numerous that organism was on the given sample date, and gives an adjusted mean length.

e) Biomass: This uses the total mean length and a wet length to dry weight relationship specific to each organism (Table 4) to determine biomass. Make sure you are using the correct equation for the organism.

f) Weighted biomass: The same equation as biomass is used, but with the weighted mean length rather that total mean length.

g) Group weighted biomass and group weighted length are simply the sums of ovigerous and non-ovigerous orgamisms.

h) Make sure that the totals include all data.

QA/QC PROCEDURES

To assure precise and accurate data, quality assurance (QA) and quality control (QC) measures must be taken.

Internal QA and QC Measures

1. Follow the general laboratory procedures ensuring the cleanliness of all glassware, the exact preparation and addition of reagents or standards, and the use of serial dilutions with every nutrient batch.

2. Track reagent changes by plotting reagent age (days) against a standardized absorbance value (Table 3, Figure 9). A linear equation with a concentration value outside of an R^2 of 0.90 for the corresponding reagent age is unacceptable and will require the test to be redone (Figure 9). Large Y intercepts are also unacceptable requiring the test to be redone. As reagents age, a given absorbance will give different values. Most of our tests show a decreasing exponential relationship, TP/TFP show an increasing relationship.

    a) Choose a standardized absorbance value and enter the value into column A. The standardized absorbance value chosen should reflect an average corrected absorbance value from the data.
    b) Enter the actual linear formulas for the specific test into column B.
    c) Enter the corresponding age (days) of the reagent for the linear formula into column C.
    d) Enter the value calculated by substituting the standardized absorbance value into the linear equation into column D.
    e) Plot the reagent days against the calculated value using a scatter plot (see general procedures) to get a linear equation and r^2.

External QA and QC Measures

1. Use certificate of analysis nutrient samples, these nutrients come in a prepared ampule with the reference value in a sealed envelope. The certificate of analysis provides an advisory range from the "National Standards for Water Proficiency Testing Studies Criteria Document," US EPA, December 1998, at the 95% confidence level.

2. Send duplicate water samples to ADF&G's CRL program for analysis. In 2001 the Near Island Limnology lab sent three replicate samples for comparison. CRL participates in the U.S. Geological Survey's analytical evaluation program for standard reference samples.

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Table 1. Limnology sampling schedule, and number of water and zooplankton samples, by lake in the Westward Region for the 2002 field season (May-June 02 and July-Sept 03).

Lake	Project	Number of Stations	Sampling Months: May	June	July	August	September	Sampling Interval	Times to Sample in 2002	Number of Samples: Water	Zooplankton
Laura	Post Fertilization	1	W, Z		W, Z	W, Z	W, Z	6 weeks	4	4	4
L. Waterfall	Post Fertilization and Stocking	1	W, Z		W, Z	W, Z	W, Z	6 weeks	4	4	4
Afognak	Post Fertilization and Broodstock	1	W, Z		W, Z	W, Z	W, Z	6 weeks	4	4	4
Lower Malina	Post Fertilization	1	W, Z		W, Z	W, Z	W, Z	6 weeks	4	4	4
Upper Malina	Fertilization	1	W, Z		W, Z	W, Z	W, Z	6 weeks	4	4	4
Spiridon	Stocking/EA compliance	2	W, Z	W, Z	W, Z	W, Z	W, Z	4 weeks	5	10	10
Hidden	Stocking/EA compliance	1	W, Z	W, Z	W, Z	W, Z	W, Z	4 weeks	5	5	5
Ruth	Post stocking monitoring	1	Z		Z	Z	Z	6 weeks	4	0	4
Lower Jennifer	Post stocking monitoring	1	Z		Z	Z	Z	6 weeks	4	0	4
L. Kitoi	Stocking, Post fertilization, HS Monitoring	1	W, Z		W, Z	W, Z	W,Z	6 weeks	4	4	4
Crescent	Stocking	1	Z		Z	Z	Z	6 weeks	4	0	4
Big Waterfall	Stocking	1	Z		Z	Z	Z	6 weeks	4	0	4
Frazer	General monitoring	2	Z	Z	Z	Z	Z	4 weeks	5	0	10
Saltery	Broodstock monitoring	1	Z		Z	Z	Z	6 weeks	4	0	4
Karluk	General monitoring	1	Z	Z	Z	Z	Z	4 weeks	5	0	5
Totals Kodiak:										39	74
Chignik	General monitoring	2	W, Z	W, Z	W, Z	W, Z	W, Z	3 weeks	7	24	14
Black	General monitoring	1	W, Z	W, Z	W, Z	W, Z	W, Z	3 weeks	7	6	7
Bear	General monitoring	2	W, Z	W, Z	W, Z		W, Z	6 weeks	4	16	4
Totals Chignik/AKPen:										46	25
Totals All:										85	99

Note: W - water sampling; Z - zooplankton sampling

Table 2. Formulating a linear equation for color calculations.

Volume of color standard (ml) for serial dilution	Volume of de-ionized (DI) Water (ml) to be added for serial dilution	Known Platinum Cobalt Units (PT) at each serial dilution	Actual sample absorbance at 400 nm for each serial dilution	Corrected absorbance (x-blank)
0.00	4.00	0.0	0.000	0.000
0.10	3.90	12.5	0.019	0.019
0.20	3.80	25.0	0.046	0.046
0.30	3.70	37.5	0.064	0.064
0.50	3.50	62.5	0.103	0.103
1.00	3.00	125.0	0.210	0.210
2.00	2.00	250.0	0.420	0.420
3.00	1.00	375.0	0.615	0.615
3.50	0.50	437.0	0.726	0.726
3.70	0.30	462.0	0.769	0.769
3.80	0.20	475.0	0.786	0.786
3.90	0.10	487.0	0.803	0.803
4.00	0.00	500.0	0.826	0.826

Table 3. Total ammonia reagent age vs nutrient concentration values.

Standardized absorbance value (SAV)	Calculated linear formulas	Reagent age in days (phenol)	Concentration calculated from entering SAV into linear formula (TA)
X = .100	y=154.47x-0.2372	1	15.2
X = .100	y=151.57x-4.5252	2	10.6
X = .100	y=136.31x-9.6577	5	4.0

Table 4. Wet length to dry weight relationships for calculating zooplankton biomass.

Taxa	Wet length to dry weight relationship [a]
Copepods	
Ergasilis	Lg^2.14*0.0036*density
Epischura	Lg^2.84*0.0045*density
Diaptomus	Lg^2.82*0.0043*density
Heterocope	Lg^2.88*0.0055*density
Eurytemora	Lg^1.61*0.0058*density
Cyclops	Lg^2.14*0.0036*density
Harpaticus	Lg^2.14*0.0036*density
Cladocerans	
Bosmina	Lg^2.11*0.0102*density
Daphnia l.	Lg^2.17*0.0046*density
Daphnia g.	Lg^3.31*0.0025*density
Daphnia r.	Lg^2.35*0.0036*density
Holopedium g.	Lg^2.44*0.0114*density
Chydorinae	Lg^2.11*0.0102*density
Polyphemus	Lg^1.49*0.0009*density

[a] Data supplied by Jim Edmonson, personal correspondence.

Table 5. Student's t-statistic and sample sizes (n) used to determine the number (N) of zooplankters to be measured to achive a confidence level (CL) of 95%.

n-1	t-statistic (95% CL)	n-1	t-statistic (95% CL)	n-1	t-statistic (95% CL)
1	12.7	11	2.2	21	2.08
2	4.3	12	2.18	22	2.07
3	3.18	13	2.16	23	2.07
4	2.78	14	2.14	24	2.06
5	2.57	15	2.13	25	2.06
6	2.45	16	2.12	26	2.06
7	2.36	17	2.11	27	2.05
8	2.31	18	2.1	28	2.05
9	2.26	19	2.09	29	2.05
10	2.23	20	2.09	>or= 30	1.96

Table taken from Koenings et al. (1987).

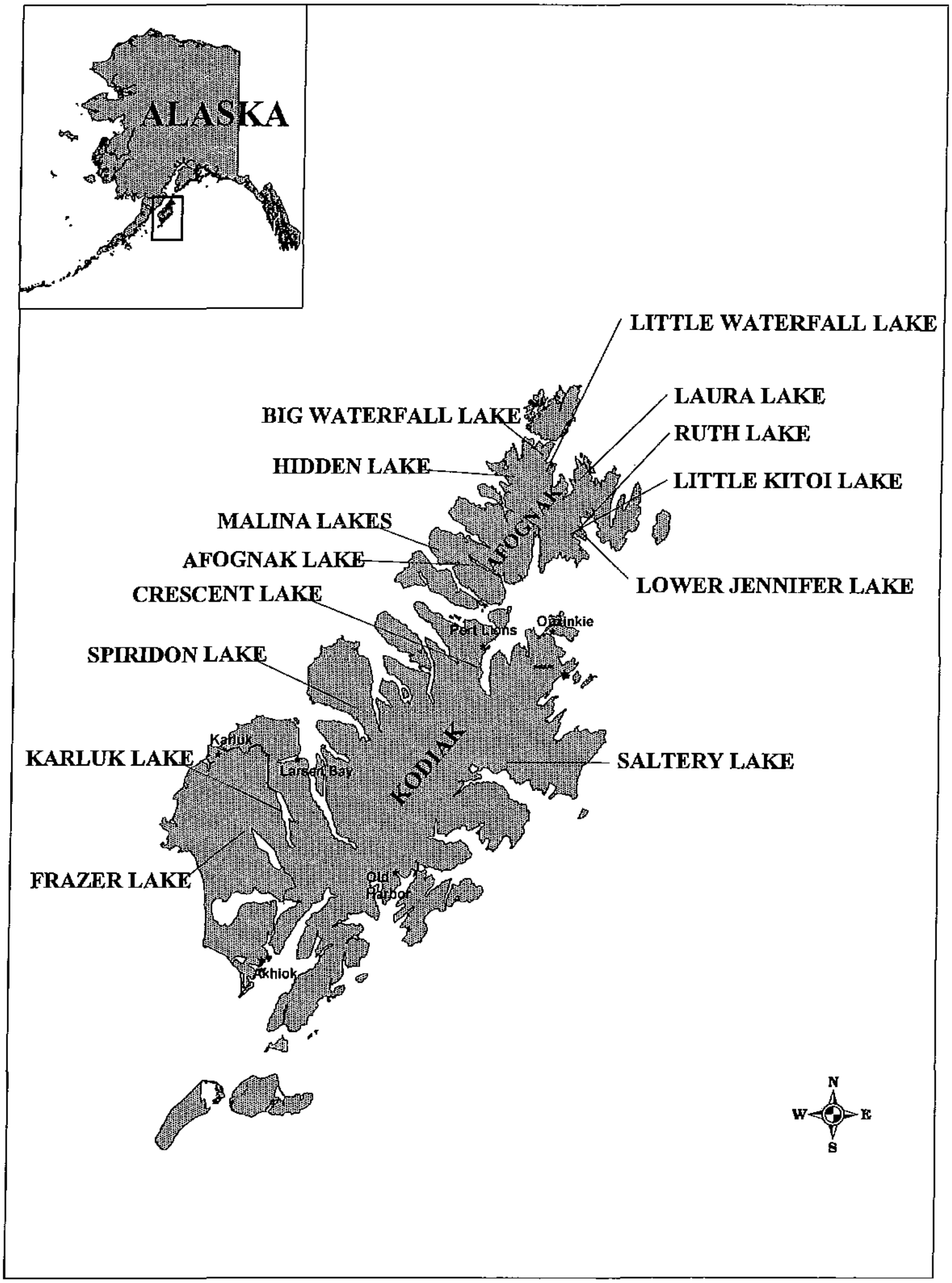


Figure 1. Location of lakes on Kodiak and Afognak Islands scheduled for limnology sampling in 2002.

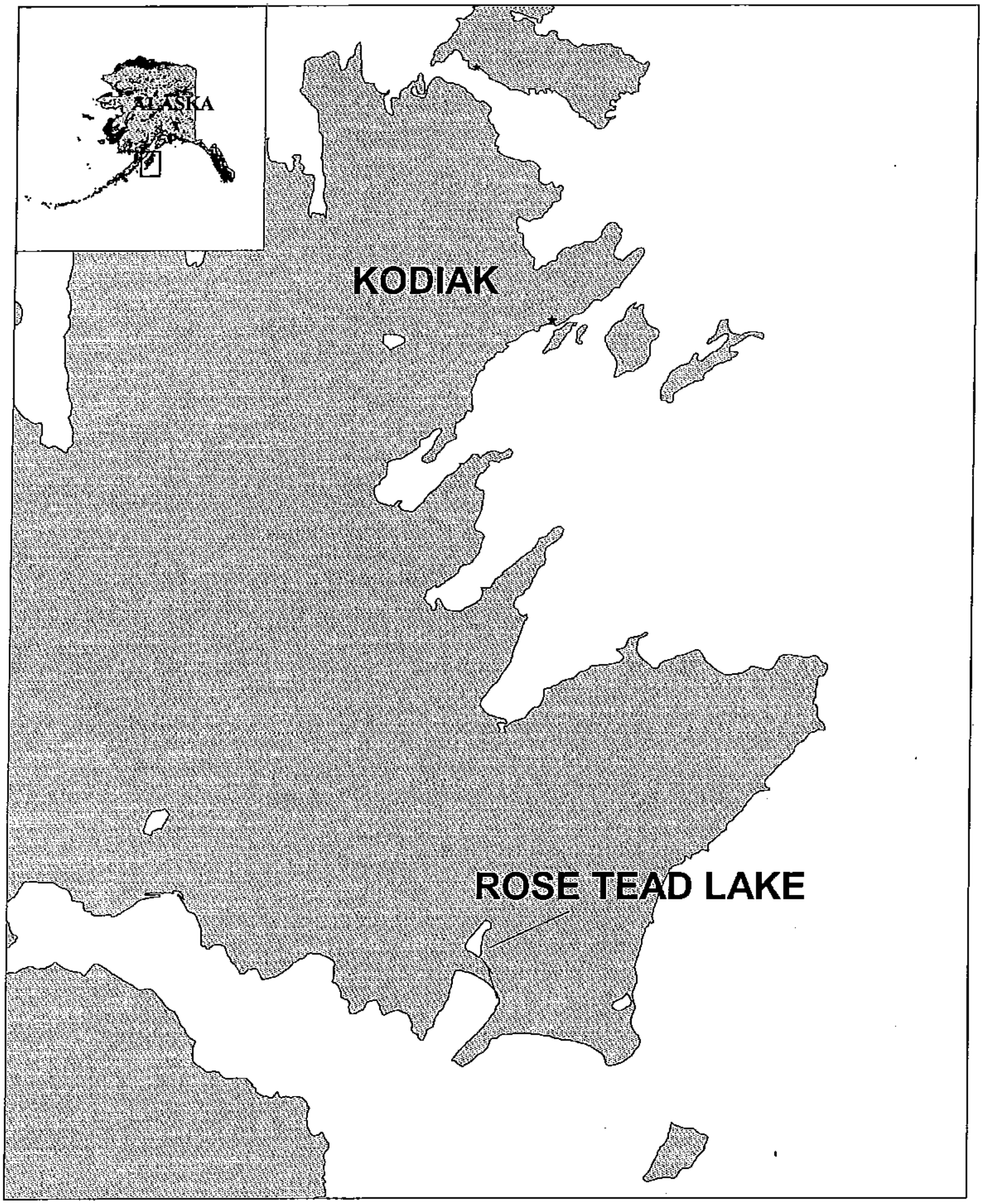


Figure 2. Location of Rose Tead Lake on Kodiak Island sampled for limnology in 2001 .

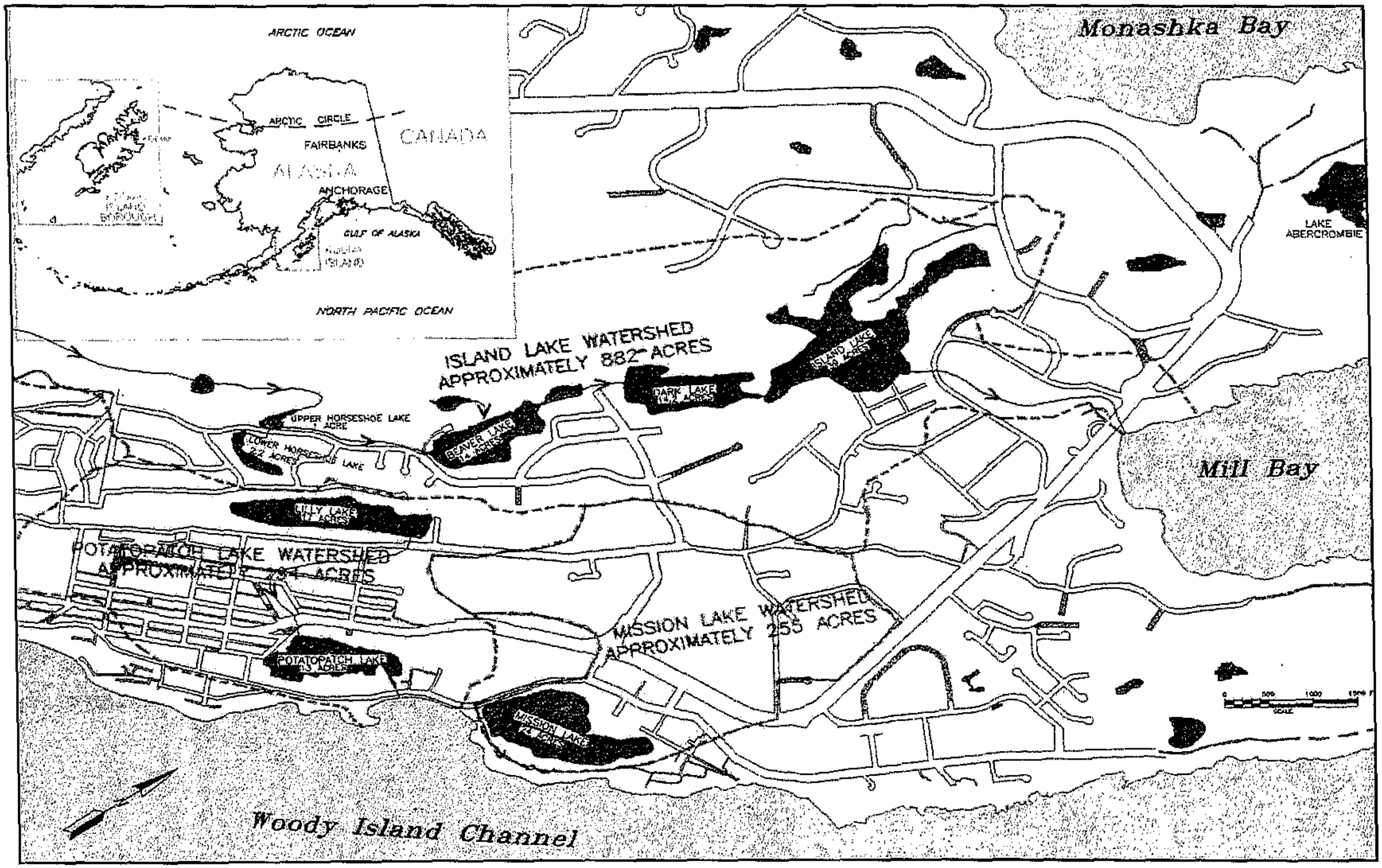


Figure 3. Location of urban lakes in Kodiak sampled for limnology in 2001 (Blakeslee 2001).

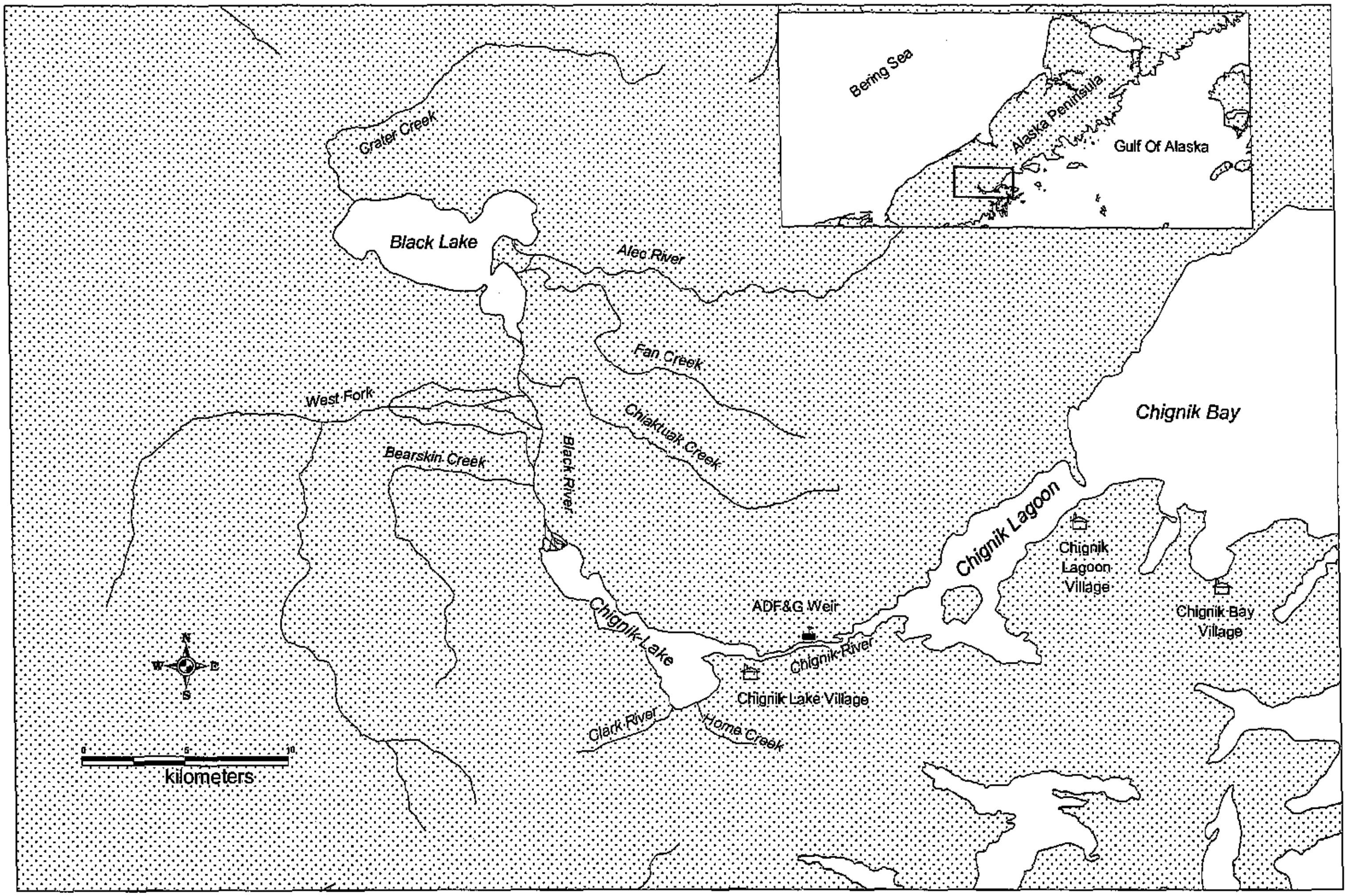


Figure 4. Location of lakes in the Chignik area scheduled for limnology sampling in 2002.

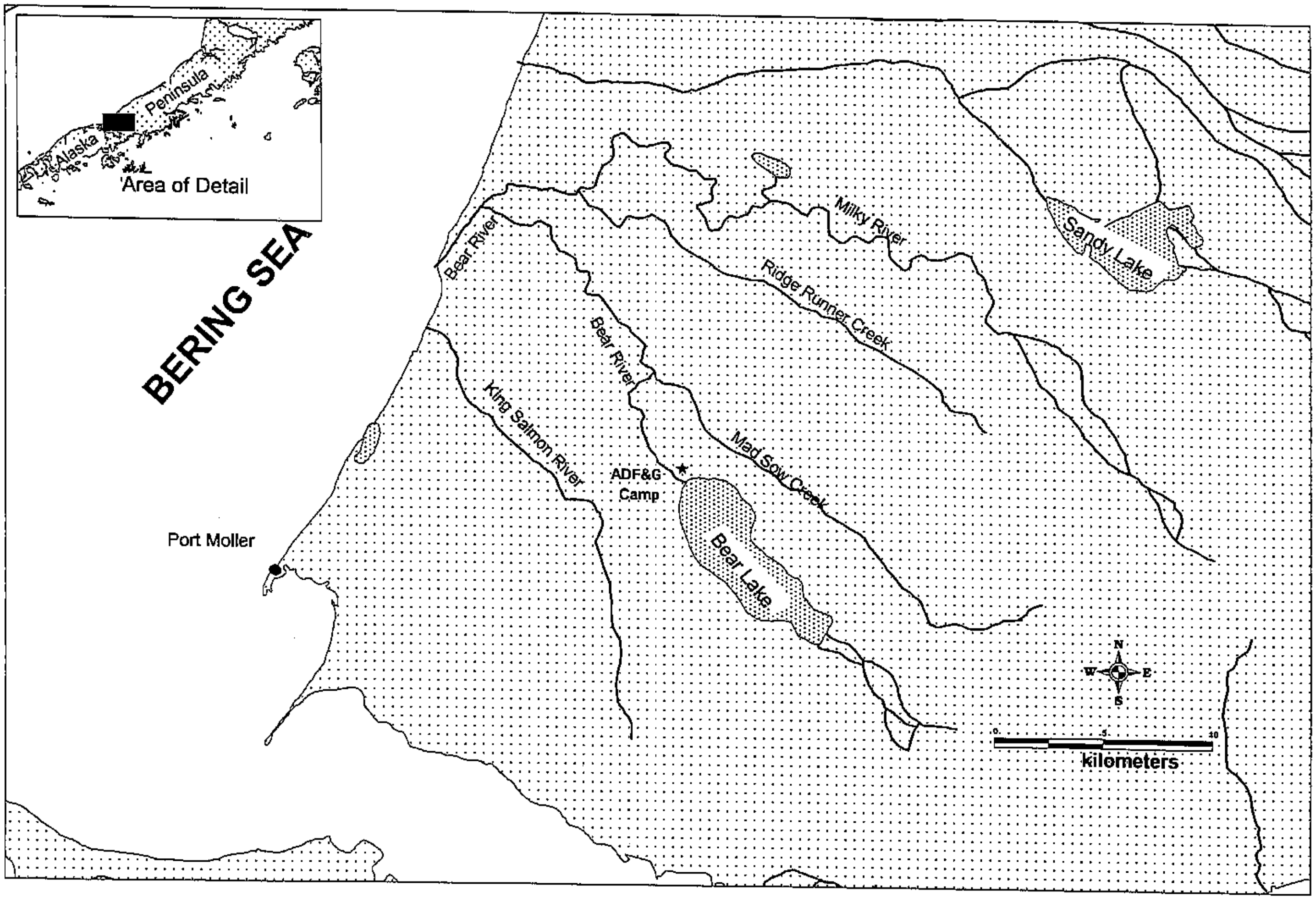


Figure 5. Location of Bear Lake scheduled for limnology sampling in 2002.

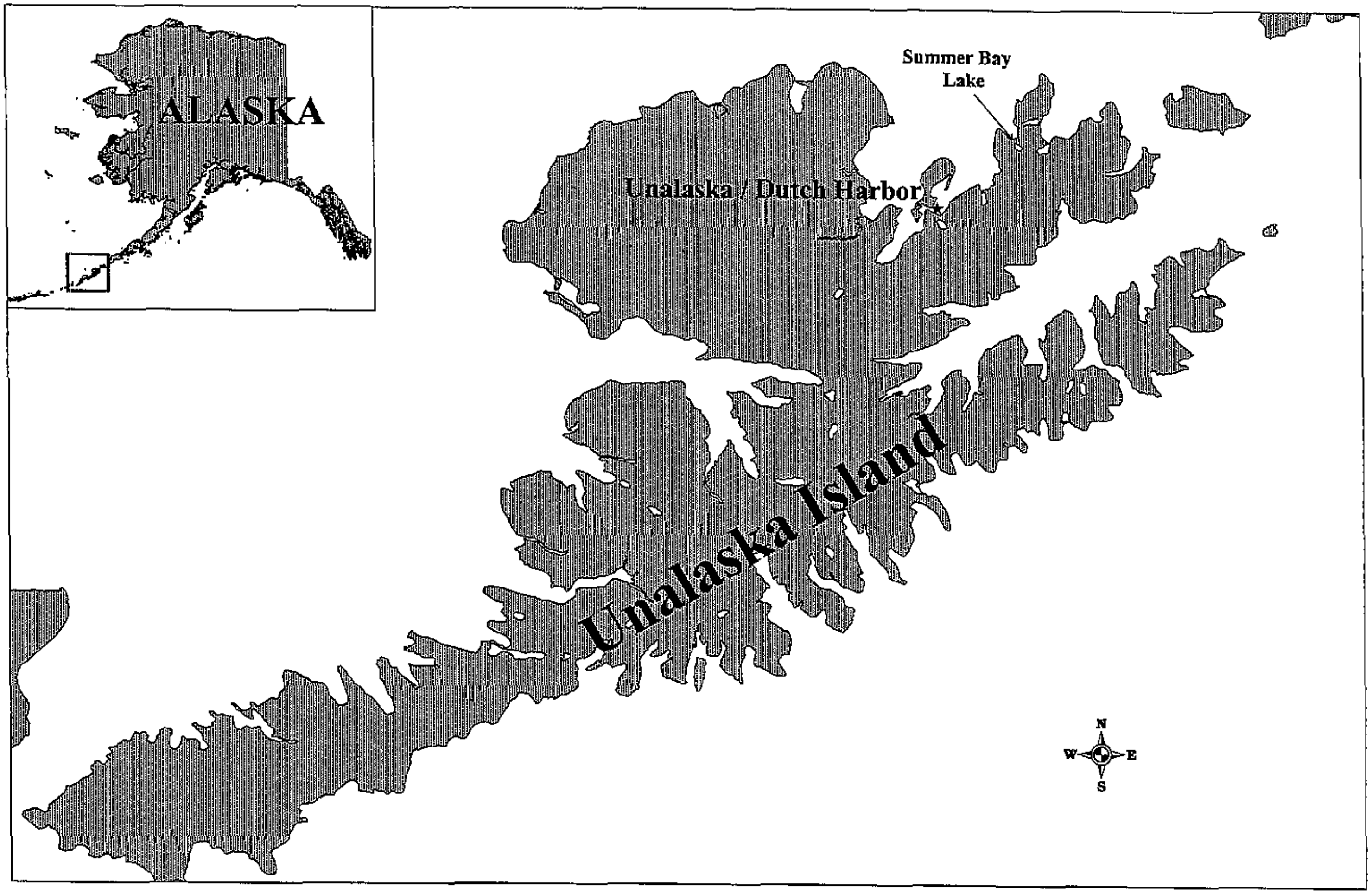


Figure 6. Location of Summer Bay Lake sampled for limnology in 2001.

Detailed Lake Survey Field Form - Division of Commercial Fisheries, Limnology Section

Lake ______ Station ______ Bottom depth ______ (m)

Weather and lake surface conditions ______

Date ______ Name (s) of sampling personnel ______ Time ______

Physical Parameters				
Depth (m)	Temperature (°C)	Dissolved Oxygen (mg/l)	Depth (m)	Solar Illuminance (Foot Candles) UP
Incidence			Incidence	
Surface			Surface	
0.5			0.5	
1.0			1.0	
1.5			1.5	
2.0			2.0	
2.5			2.5	
3.0			3.0	
3.5			3.5	
4.0			4.0	
4.5			4.5	
5.0			5.0	
6.0			6.0	
7.0			7.0	
8.0			8.0	
9.0			9.0	
10.0			10.0	
11.0			11.0	
12.0			12.0	
13.0			13.0	
14.0			14.0	
15.0			15.0	
16.0			16.0	
17.0			17.0	
18.0			18.0	
19.0			19.0	
20.0			20.0	
21.0			21.0	
22.0			22.0	
23.0			23.0	
24.0			24.0	
25.0			25.0	
30.0			26.0	
35.0			27.0	
40.0			28.0	
45.0			29.0	
50.0			30.0	

Hand held temp. water: ______ air: ______

DO Meter ______ Light Meter ______

__Water samples:__

were / were not collected for lab analysis.

Depths of samples: (m), (m) and (m)

Samples were filtered in the lab.

__Zooplankton:__

One Vertical tow was taken at each station.

Station No. Bottom depth ______ (m)

Zooplankton tow depth ______ (m)

Station No. Bottom depth ______ (m)

Zooplankton tow depth ______ (m)

Net size was **20cm x 153u.**

Each tow was preserved separately in 10% Buffered Formalin.

__Secchi disk:__

disappeared: ______ (m)

reappeared: ______ (m)

Mean disk reading: ______ (m)

Comments:

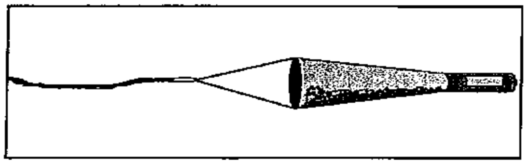


Figure 7. Detailed lake survey field form.

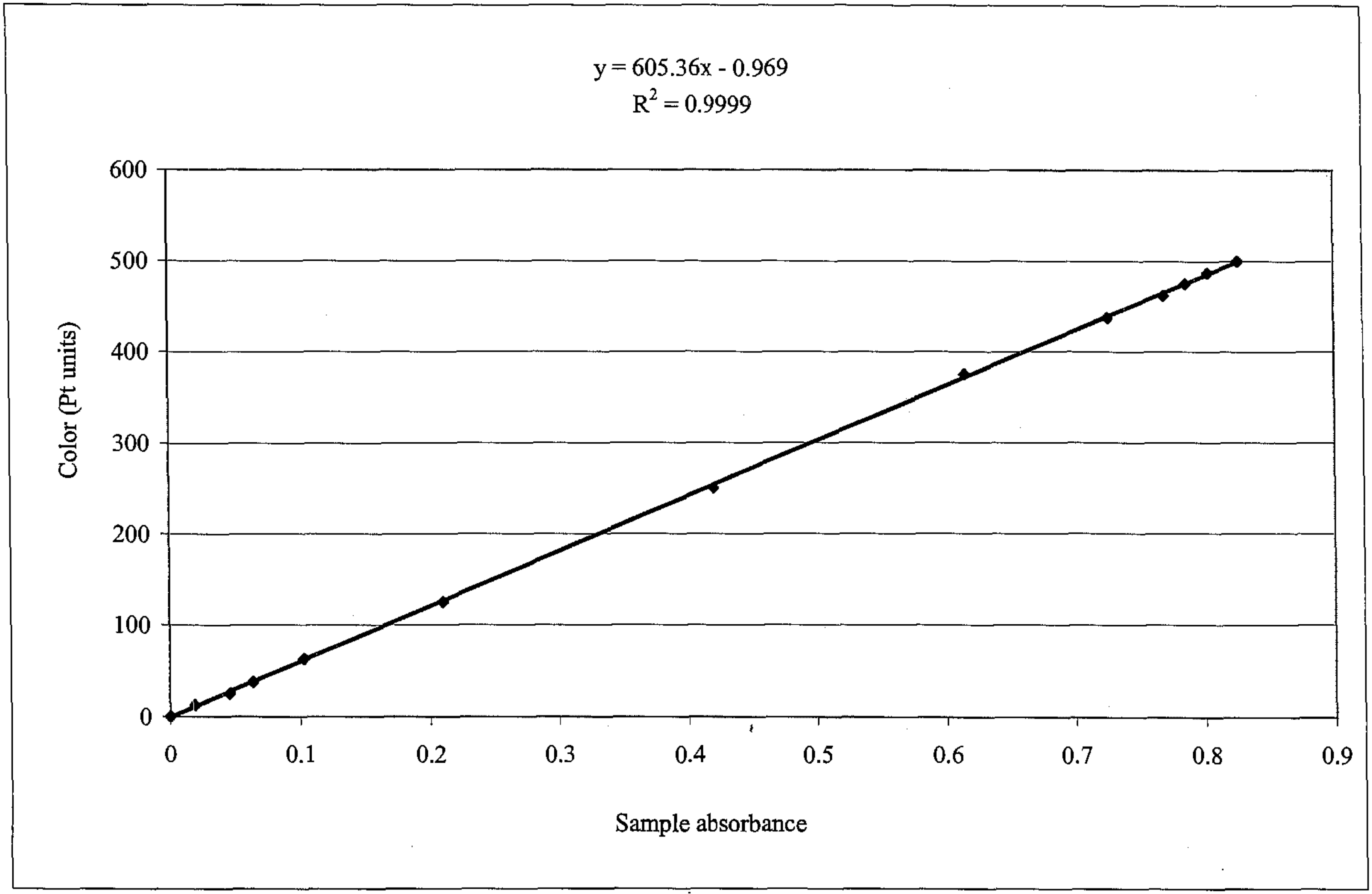


Figure 8. Formulating a linear equation for color calculations.

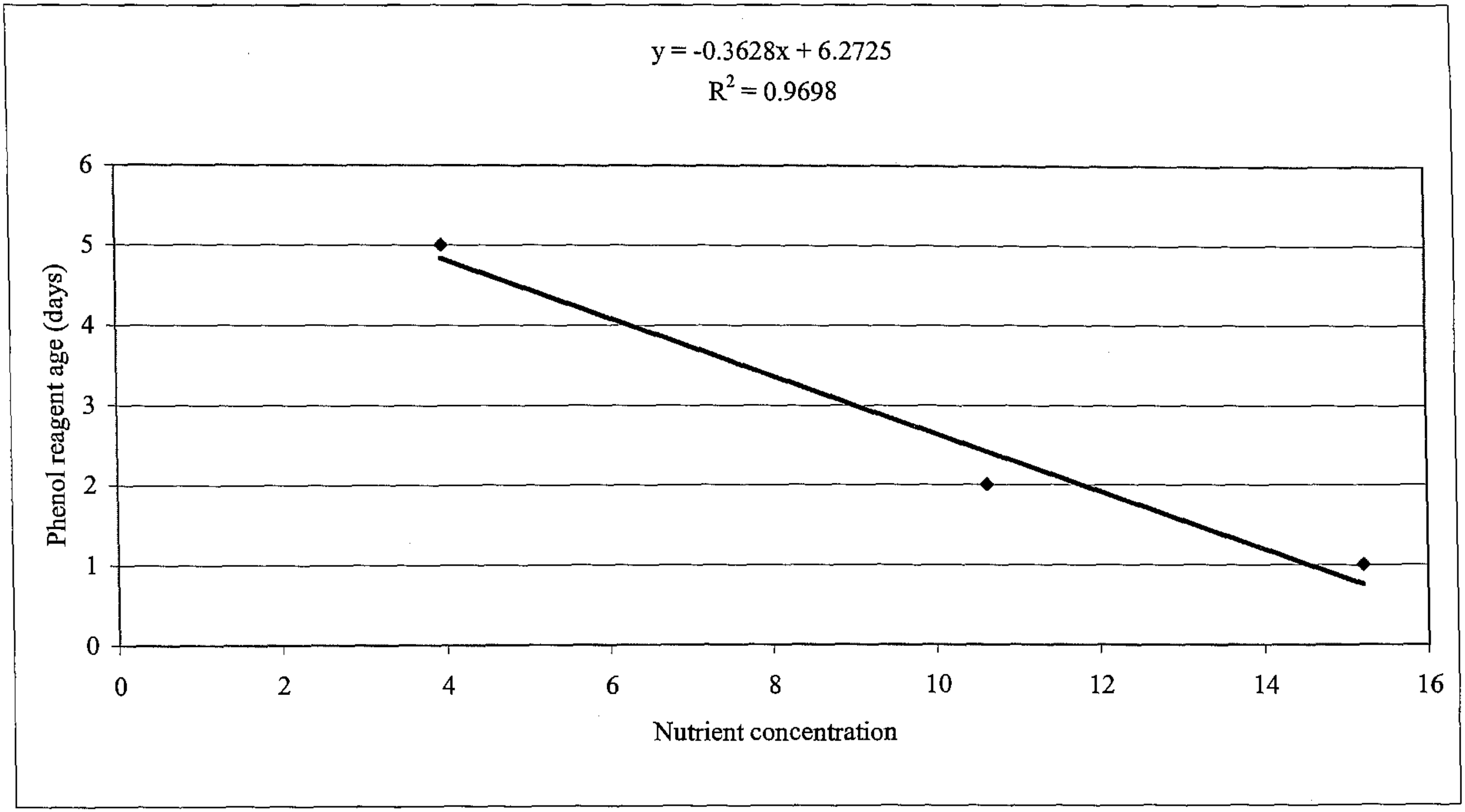


Figure 9. Total ammonia reagent age vs nutrient concentration values.

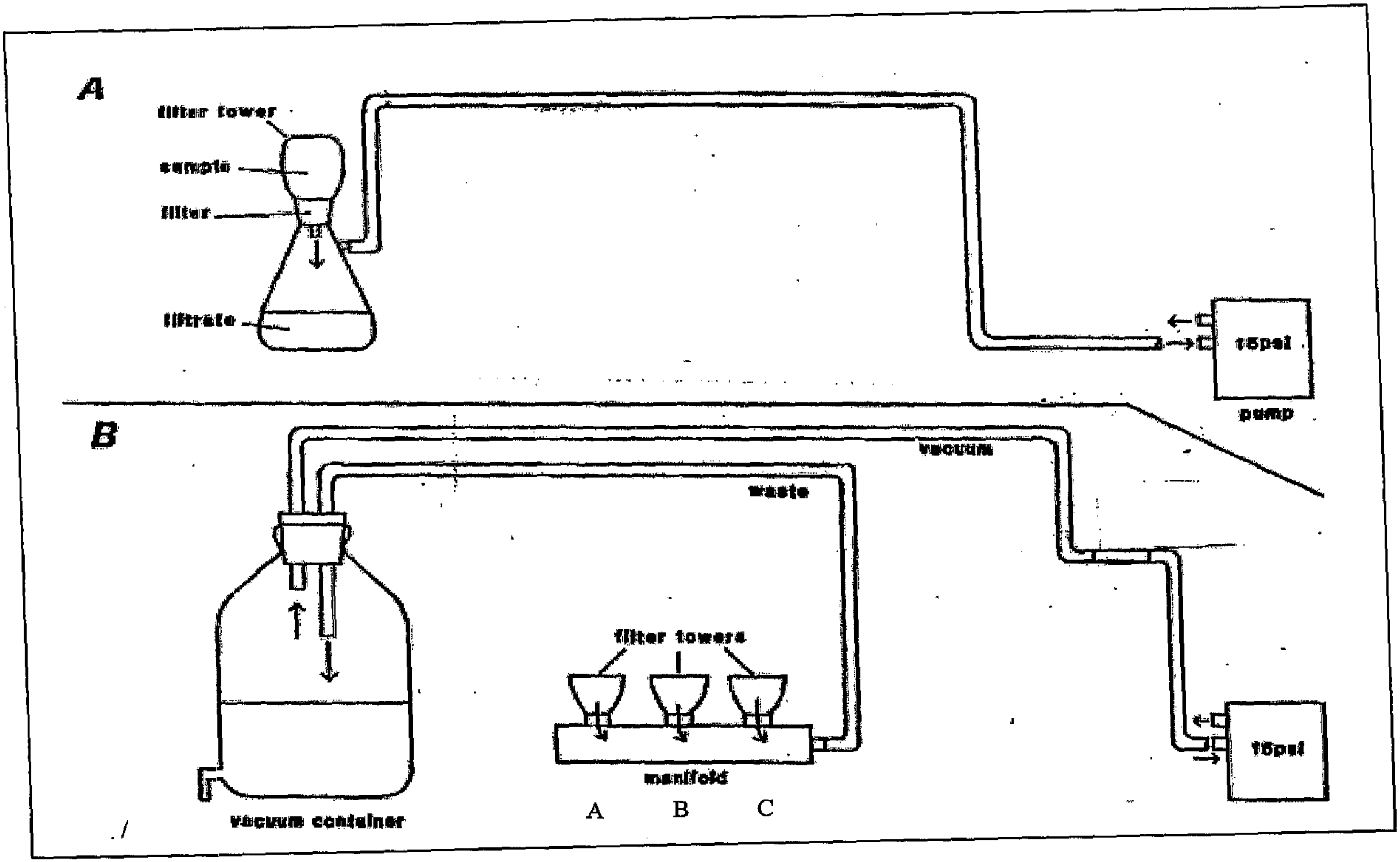


Figure 10. Apparatus used to process samples by vacuum filtration to obtain particulates and filtrate: A) using one filtrate flask and B) using a filtering manifold. Figure adapted from Koenings et. al. (1987).

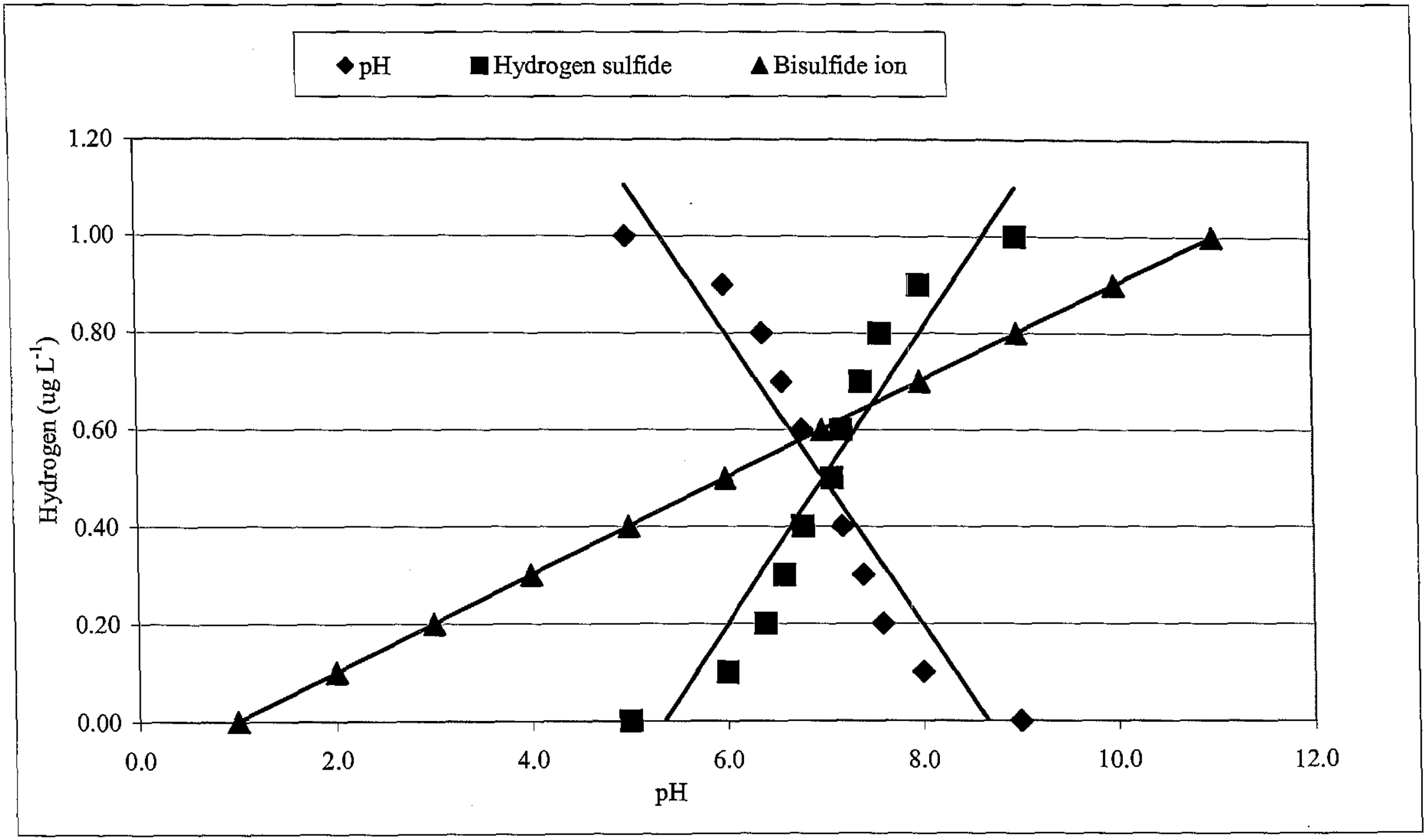


Figure 11. Hydrogen sulfide concentration and toxic calculations.

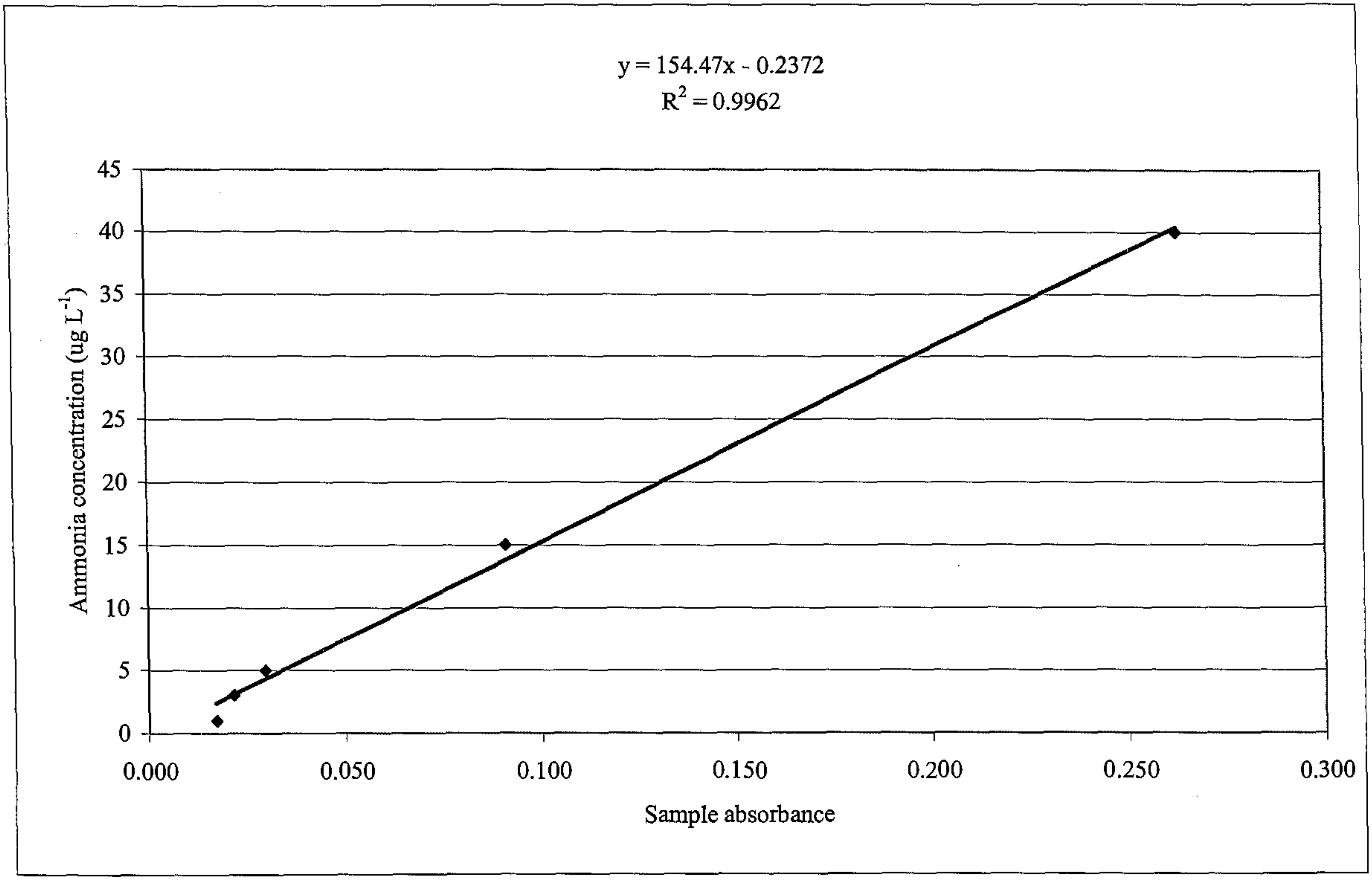


Figure 12. Total ammonia (TA) calculations.

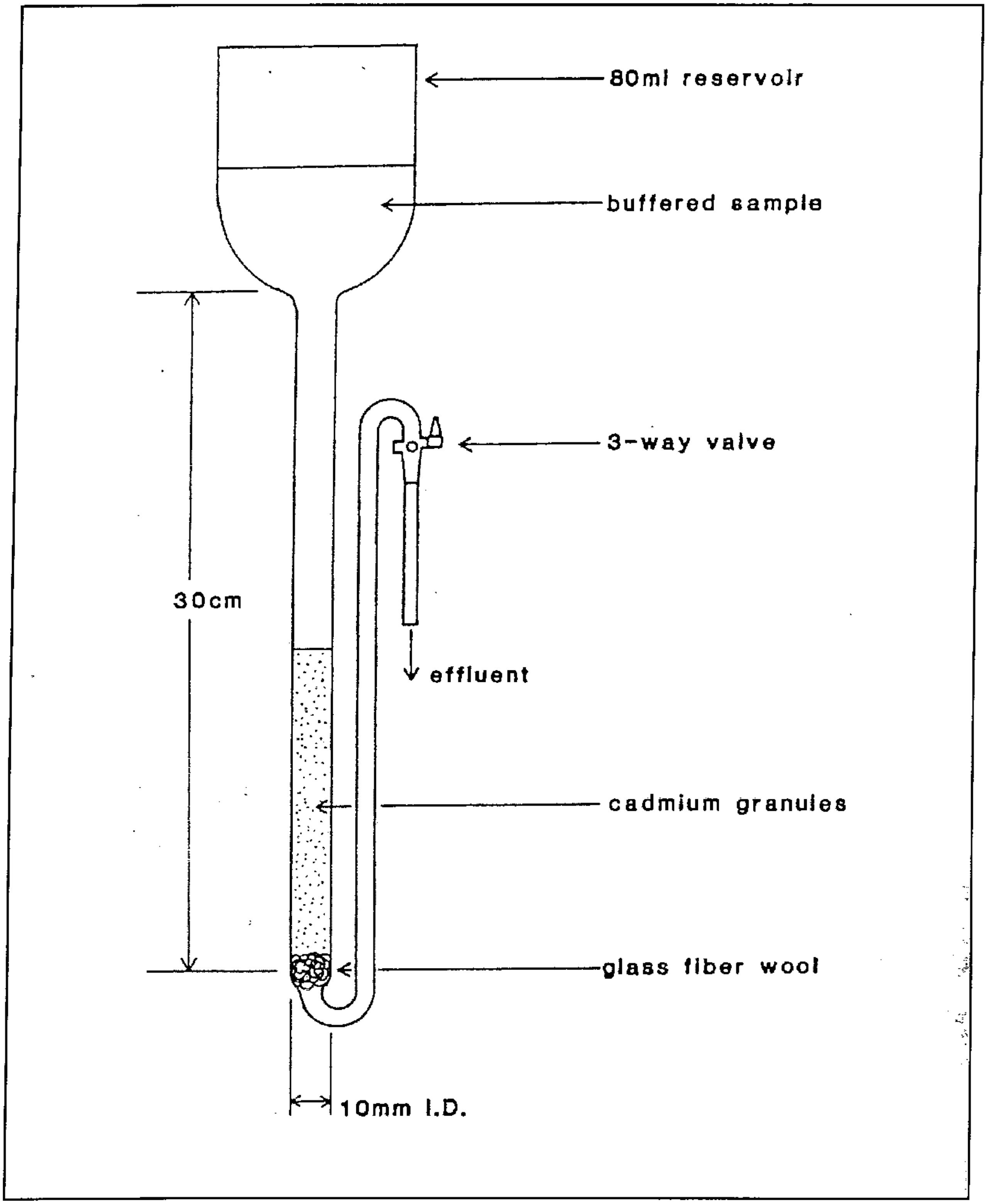


Figure 13. Cadmium column used to reduce nitrate to nitrite in the manual analysis of nitrate + nitrite nitrogen (Koenings et al. 1987).

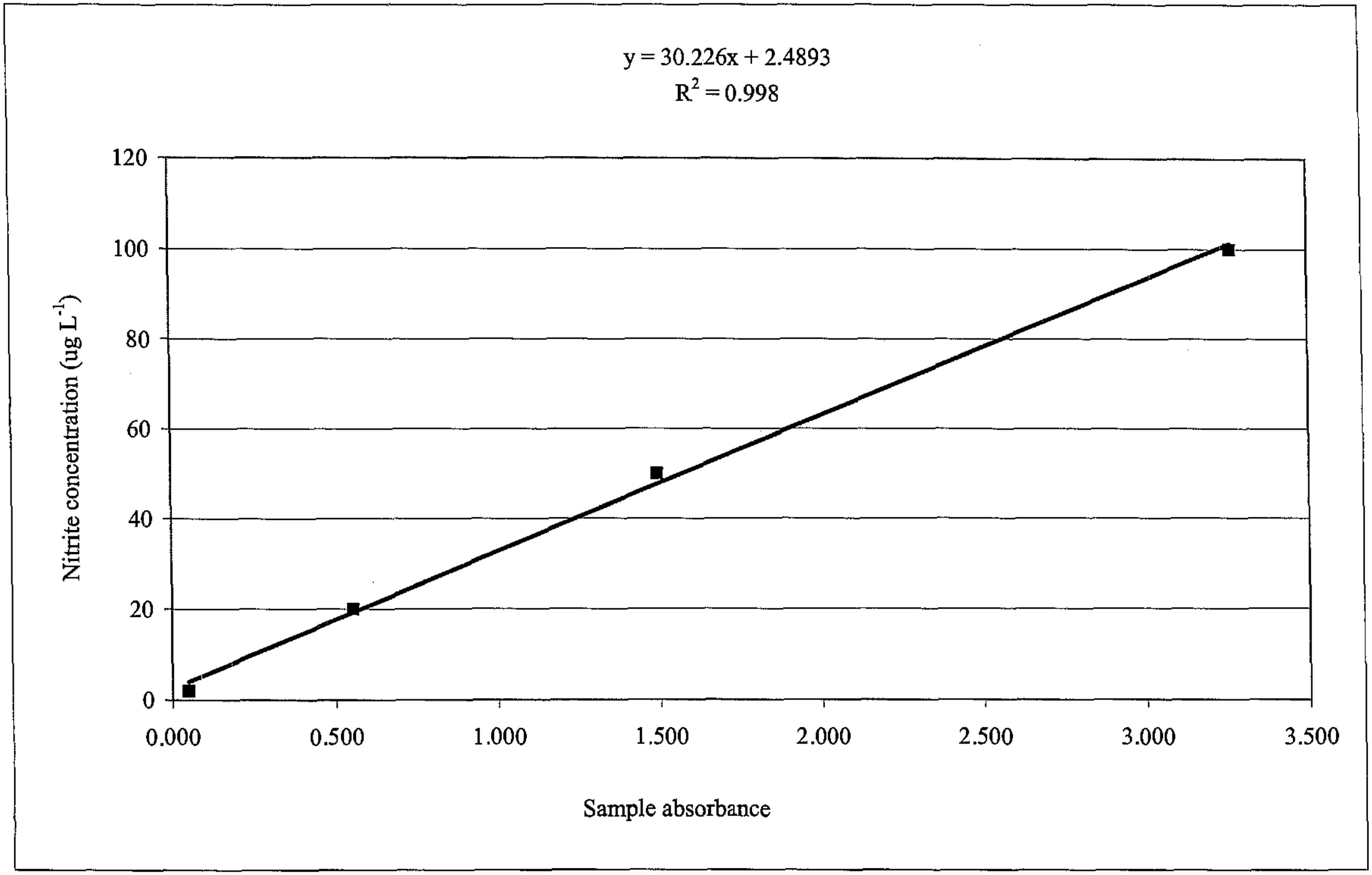


Figure 14. Nitrate + Nitrite calculations

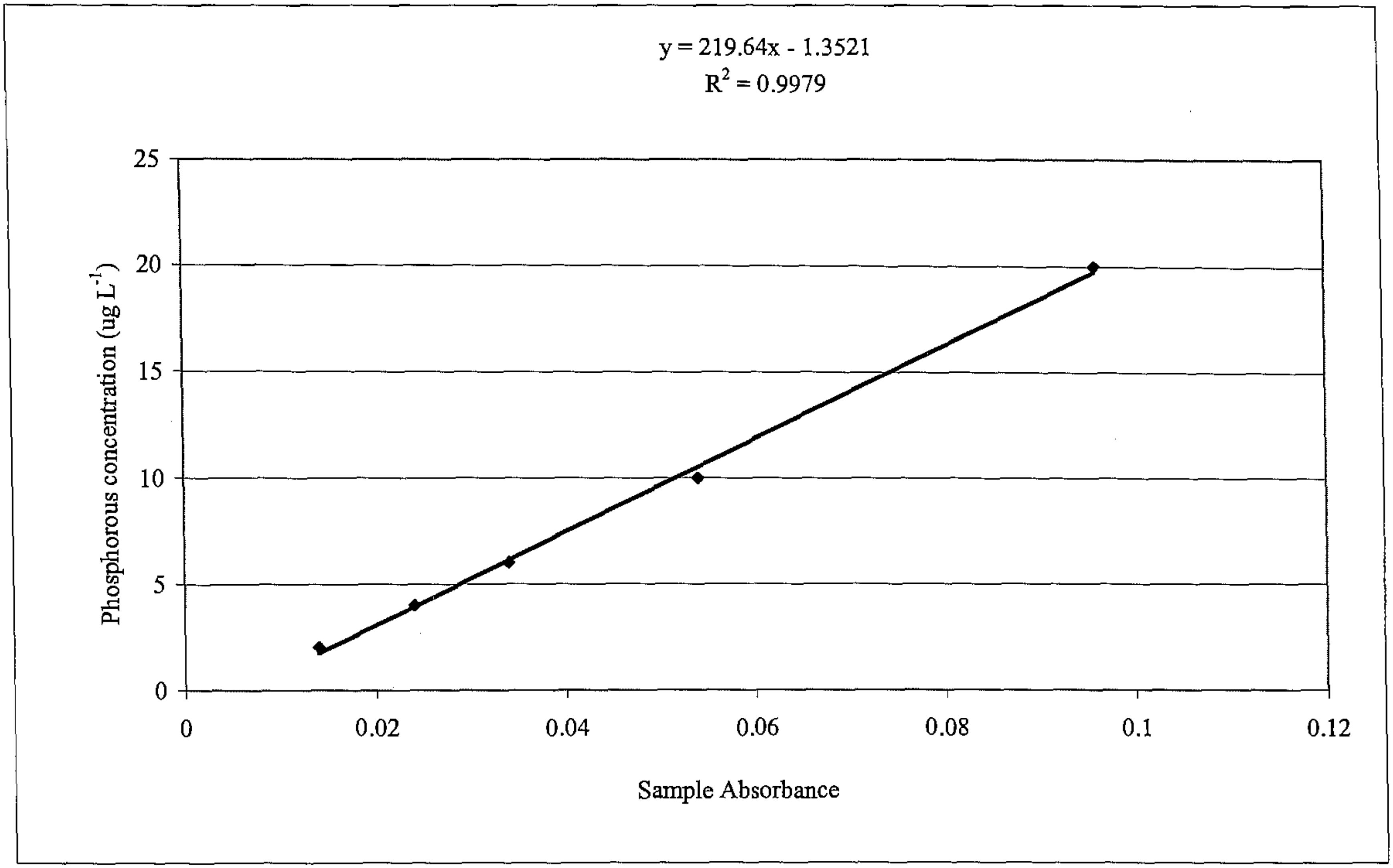


Figure 15. Total phosphorous (TP) and total filterable phosphorous (TFP) calculations.

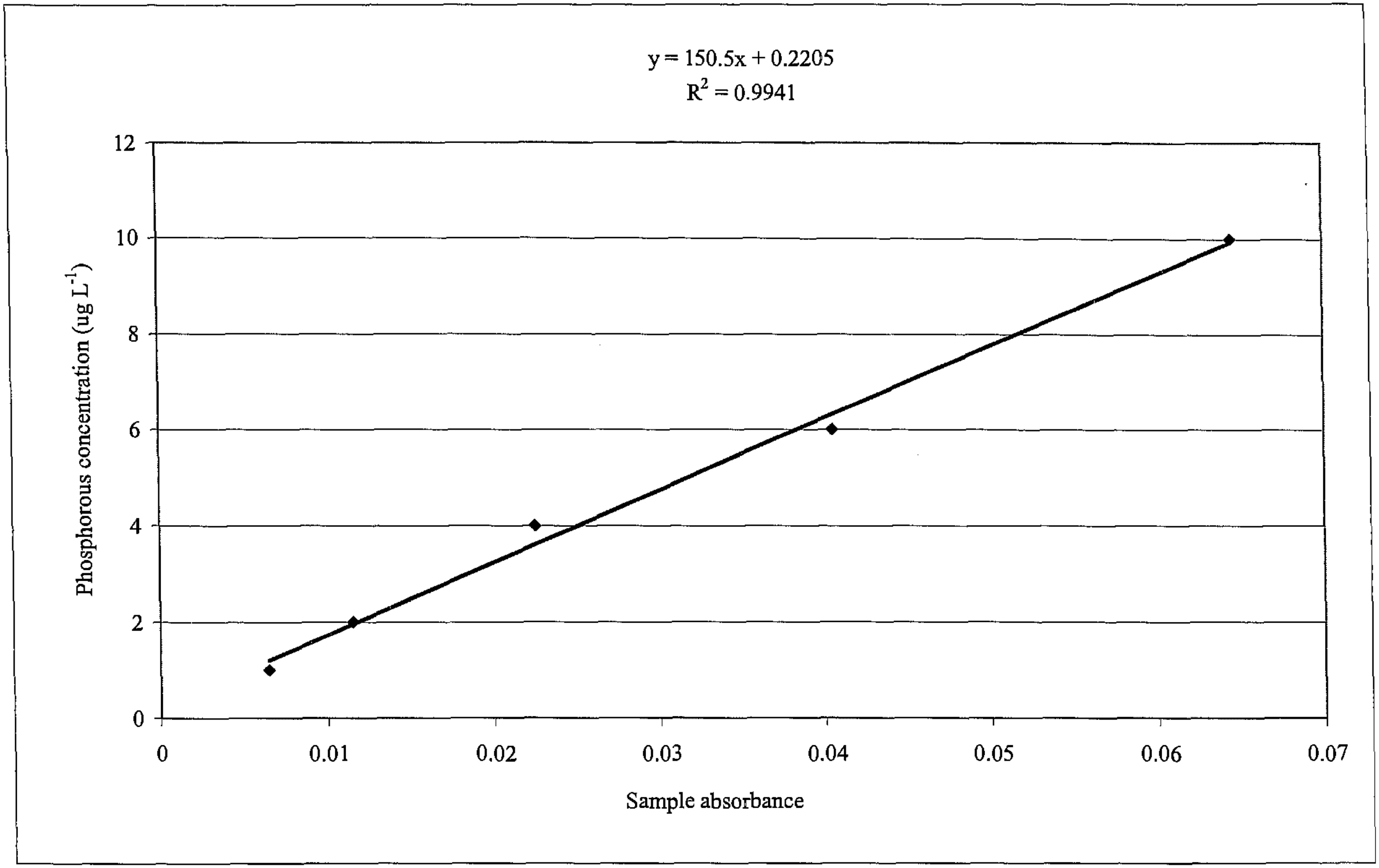
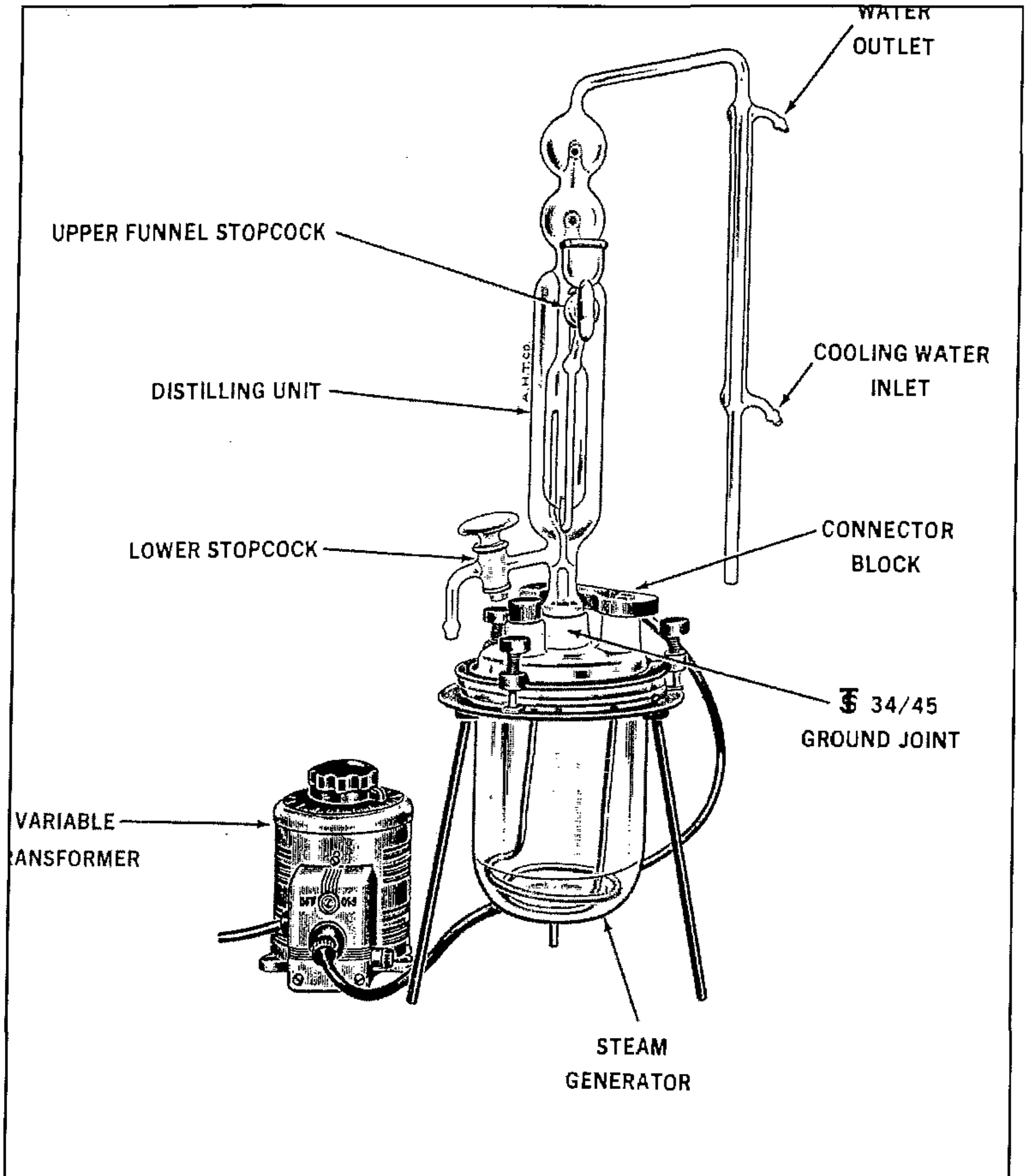


Figure 16. Filterable reactive phosphorous (FRP) calculations,



7052-J10 Micro Kjeldahl Distilling Apparatus

Figure 17. Micro kjeldahl distilling apparatus for manual total kjeldahl nitrogen (TKN) analysis (Thomas Scientific operating instructions).

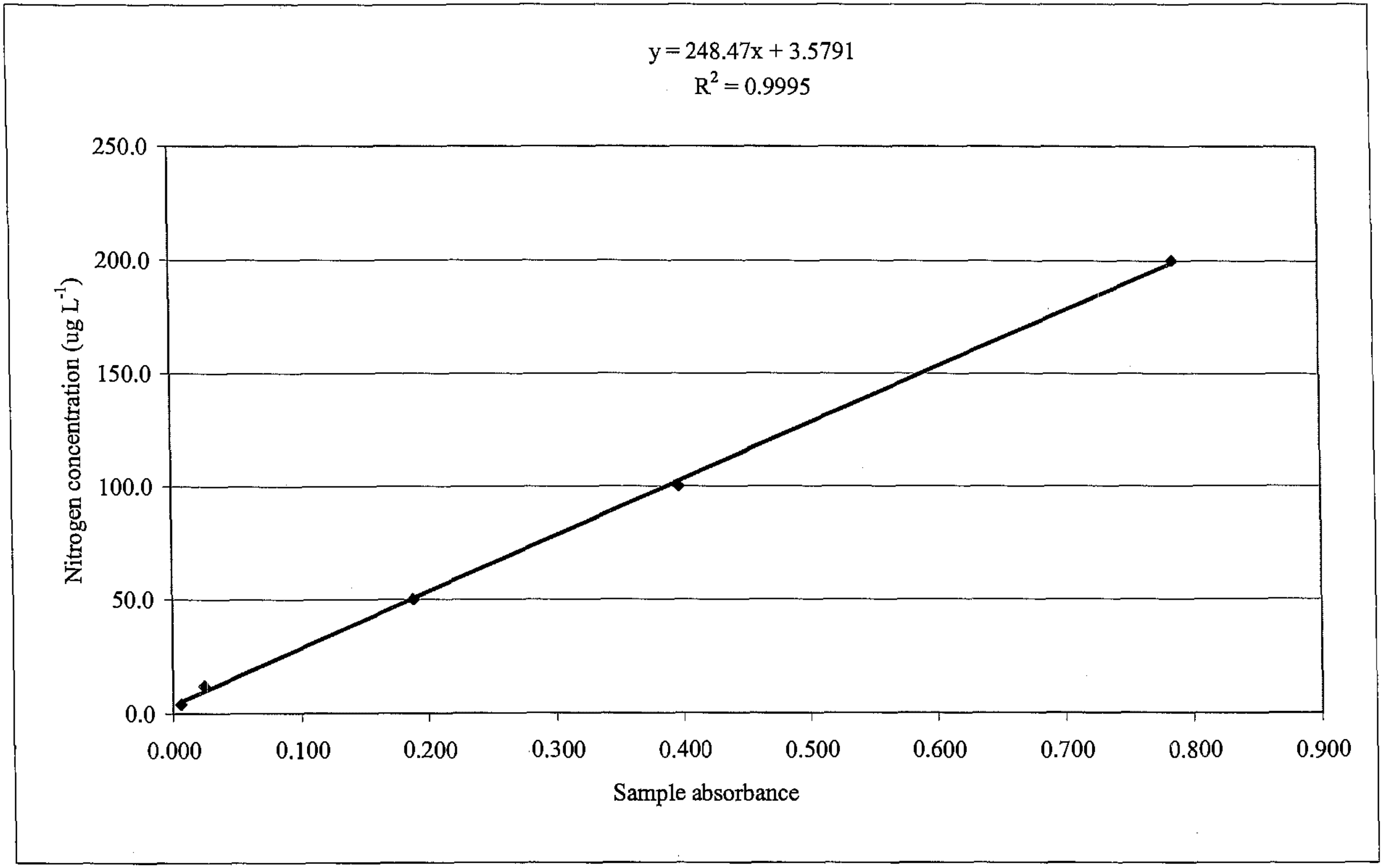


Figure 18. Total kjeldahl nitrogen (TKN) calculations.

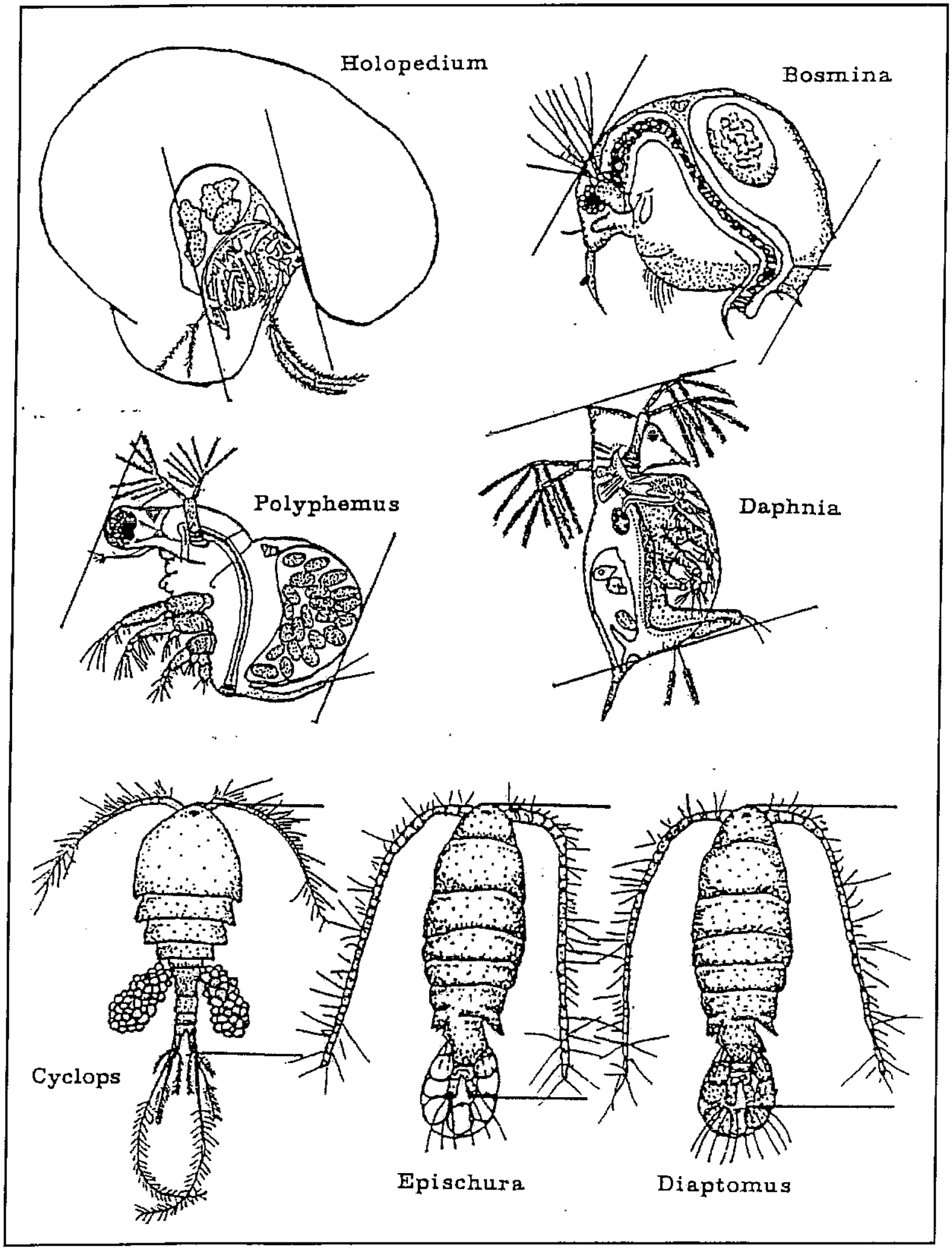


Figure 19. Common cladocerans and copepods with locations of anterior and posterior measuring points (Koenings et al. 1987).

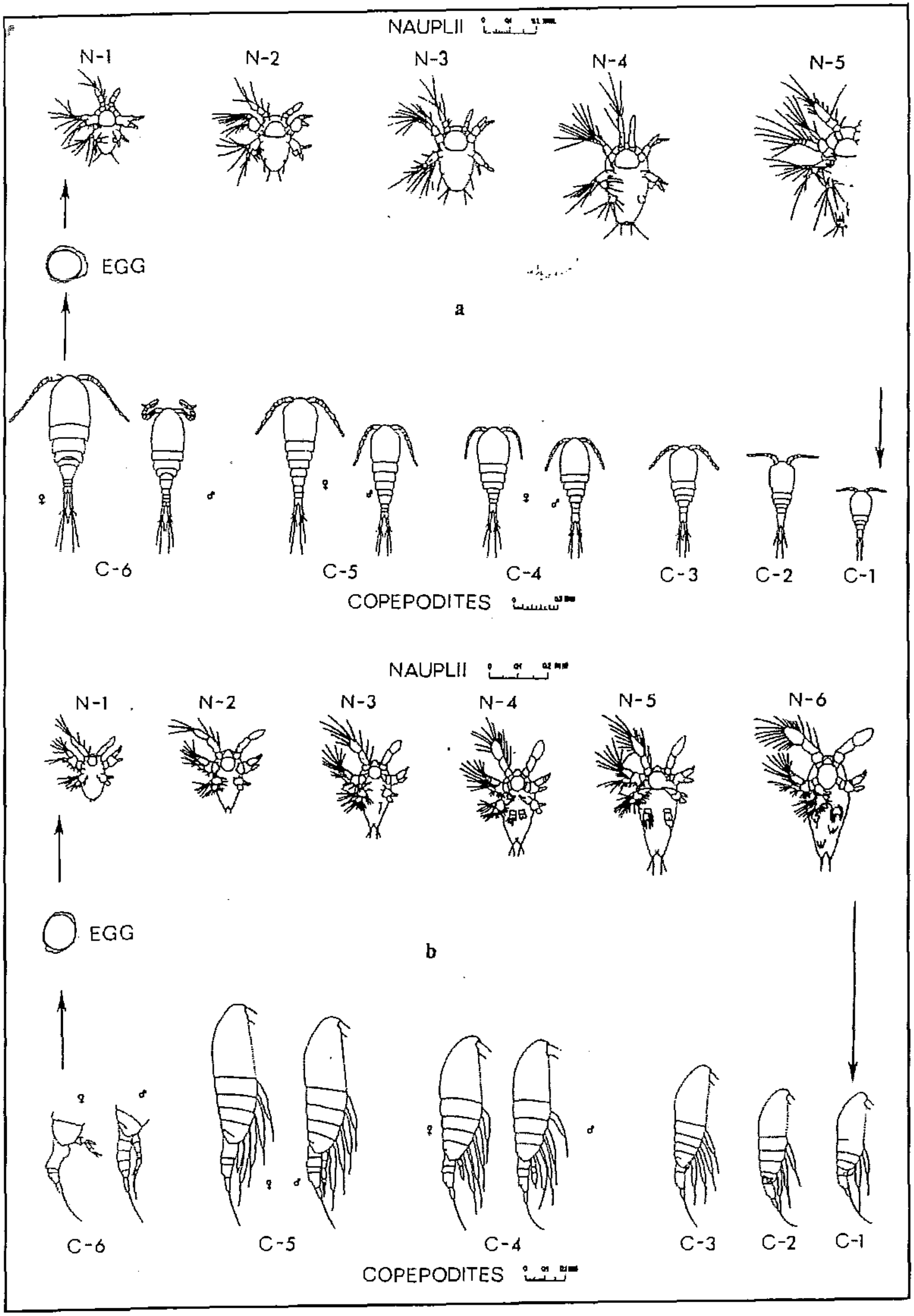


Figure 20. Copepod life history stages (Wetzel and Likens 1991).

APPENDIX

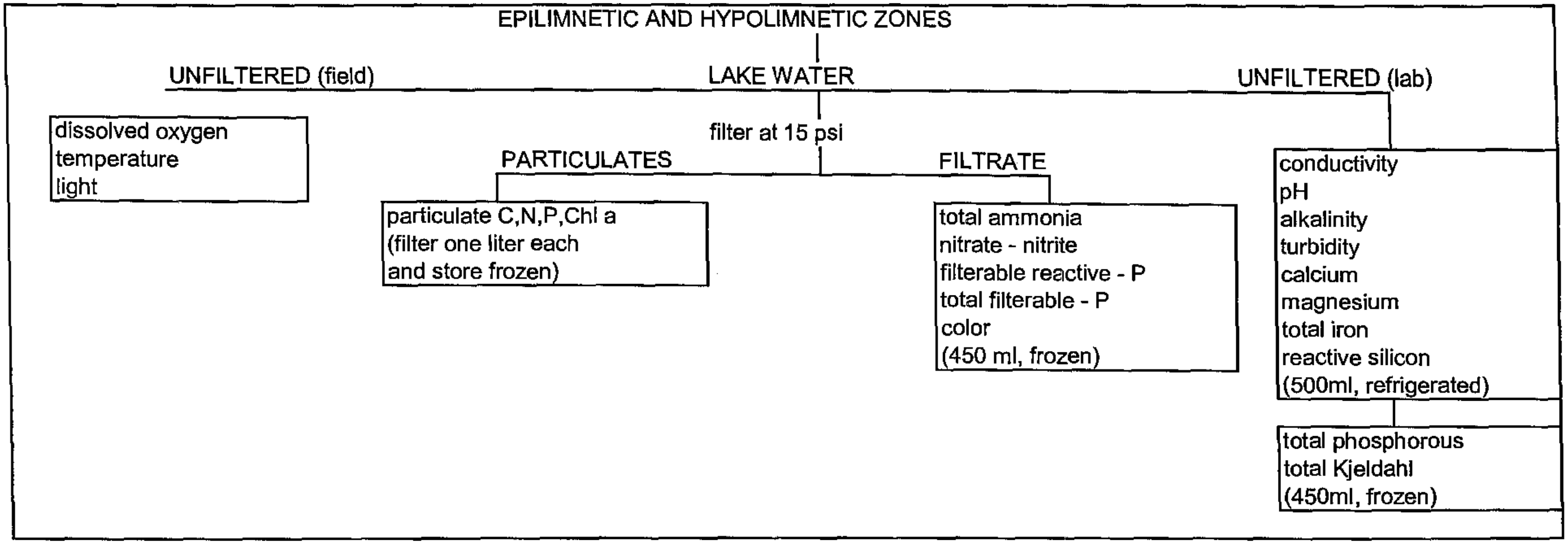
Appendix A. Field sampling equipment list.

Equipment	Task
Van Dorn bottle	Water samples
Rope marked in Meters	"
Messenger	"
Carboys 1 per original station	"
20-cm x 153-um mesh Plankton net	Zooplankton samples
Rope marked in meters	"
1-125 ml poly bottles (Per station) with 12.5 ml of 100% buffered formalin in each bottle.	"
D.O./temperature meter (cord marked in meters)	Temp/DO readings
Photometer (cord marked in 1/2 meters)	Light level readings
Secchi disk	Water clarity reading
Clip board/rite in rain paper	Data entry
Sandbags (3 bags per station) or anchor, rope and buoy.	Station set up

Appendix B. Lab water filtering equipment list.

Equipment		Task
Poly bottles (labeled) per Carboy 1 m sample:	(2) 500 ml	500 ml unfilt. refrig. 500 ml filtrate frozen
	(1) 125 ml	1-phytoplankton
	(1) 250 ml	200 ml unfilt. frozen
Whatman GF/F filters/petri slides per Carboy 1 m and deep sample:	(4) 4.25-cm	Particulate filtering (CHL *a*, N, P,C)
Graduated cylinders		Sample measurement
Filter apparatus:	filter tower (4) filtrate flask (1) vacuum pump vacuum hose vacuum filter Waste water flask	Particulate filtering filtr. frozen samples
Wash bottle with filtered water bottle washing station		Rinsing filter apparatus
Phosphate free detergent		Washing bottles, carboys, glassware
Filtered water		Rinsing bottles, carboys, glassware after washing
Sterile forceps		Handling filters
Magnesium carbonate		Chlorophyll *a* preservation
Tin foil/Parafilm		Covering filter apparatus after disinfection

Appendix C. Sample collection protocol and procedures for lake water processing. Adapted from Koenings et. Al. (1987).



Appendix D. Template 1 - Determination of sample number for adequate body size measurement.

Organism:	Lake:	date:
First 15 measurements		
1		
2		
3		
4	n=	
5		
6	n-1=	
7	t-statistic=	
8		
9	N=	
10		
11	N=number to be measured	
12		
13		
14		
15		
mean		
s.d.		

Appendix E. Zooplankton data sheet.

Zooplankton data sheet

Lake: Sample date: Count #:

Station: depth:

This sample was diluted in _______ ml water.

Organism	Tally	Total

Name:		Name:		Name:		Name:	
#	length	#	length	#	length	#	length
1		1		1		1	
2		2		2		2	
3		3		3		3	
4		4		4		4	
5		5		5		5	
6		6		6		6	
7		7		7		7	
8		8		8		8	
9		9		9		9	
10		10		10		10	
11		11		11		11	
12		12		12		12	
13		13		13		13	
14		14		14		14	
15		15		15		15	

Appendix F. Template2 - Zooplankton count summary sheet.

Lake:
Station:
Depth:

Date:

Dilution:

	count 1	count 2	count 3	count 4	count 5	count 6	Mean	Total in sample	#/m^2	#/m^3
Ergasilis										
Epischura										
Ovig. Epischura										
Diaptomus										
Ovig Diaptomus										
Cyclops										
Ovig. Cyclops										
Harpaticus										
Nauplii										
Bosmina										
Ovig. Bosmina										
Daphnia l.										
Ovig. Daphnia l.										
Daphnia g.										
Holopedium										
Ovig. Holopedium										
Chydorinae										
Polyphemus										
Immature Cladocera										
Kellicottia										
Asplanchna										
Keratella										
Conochilus										
Filinia										
Ostracoda										
Egg thing										
Ceratium										
other rotifers										

Body Size

Cyclops	ovig. Cyc.	Bosmina	ovig. Bos.

Appendix G. Template 3 - Zooplankton m^2 density summary sheet.

Lake:
Station:
Year:

Macrozooplankton Density
(no./m^2)

Seasonal Mean

Date:	(No/m^2)	group mean
Ergasilis		
Epischura		
Ovig. Epischura		
Diaptomus		
Ovig Diaptomus		
Cyclops		
Ovig. Cyclops		
Harpaticus		
Nauplii		
Bosmina		
Ovig. Bosmina		
Daphnia l.		
Ovig. Daphnia l.		
Daphnia g.		
Holopedium		
Ovig. Holopedium		
Chydorinae		
Polyphemus		
Immature Cladocera		
Sub Total		
Kellicottia		
Asplanchna		
Keratella		
Conochilus		
Filmia		
Ostracoda		
Egg thing		
Ceratium		
other rotifers		
Total:		

Body Size (mm)	Mean length (mm)	Weighted mean length (mm)	Biomass (mg/m^2)	Weighted Biomass (mg/m^2)	Group wt'd biomass (mg/m^2)	Group wt'd length (mm)
Ergasilis						
Epischura						
Ovig. Epischura						
Diaptomus						
Ovig. Diaptomus						
Cyclops						
Ovig. Cyclops						
Harpaticus						
Nauplii						
Bosmina						
Ovig. Bosmina						
Daphnia l.						
Ovig. Daphnia l.						
Daphnia g.						
Holopedium						
Ovig. Holopedium						
Chydorinae						
Polyphemus						
TOTAL:						

Appendix H. Template 4 - Zooplankton m^3 density summary sheet.

Lake:
Station:
Year:

Macrozooplankton Density (no./m^3)

Date:	Seasonal Mean (No/m^3)	group mean
Ergasilis		
Epischura		
Ovig. Epischura		
Diaptomus		
Ovig Diaptomus		
Cyclops		
Ovig. Cyclops		
Harpaticus		
Nauplii		
Bosmina		
Ovig. Bosmina		
Daphnia l.		
Ovig. Daphnia l.		
Daphnia g.		
Holopedium		
Ovig. Holopedium		
Chydorinae		
Polyphemus		
Immature Cladocera		
Sub Total		
Kellicottia		
Asplanchna		
Keratella		
Conochilus		
Filinia		
Ostracoda		
Egg thing		
Ceratium		
other rotifers		
Total:		

Body Size (mm)	Mean length (mm)	Weighted mean length (mm)	Biomass (mg/m^3)	Weighted Biomass (mg/m^3)	Group wt'd biomass (mg/m^3)	Group wt'd length (mm)
Ergasilis						
Epischura						
Ovig. Epischura						
Diaptomus						
Ovig. Diaptomus						
Cyclops						
Ovig. Cyclops						
Harpaticus						
Nauplii						
Bosmina						
Ovig. Bosmina						
Daphnia l.						
Ovig. Daphnia l.						
Daphnia g.						
Holopedium						
Ovig. Holopedium						
Chydorinae						
Polyphemus						
TOTAL:						

HIDDEN LAKE SOCKEYE SALMON ENHANCEMENT PROJECT OPERATIONAL PLAN, 2002

By
Robert Baer

Alaska Department of Fish and Game
Division of Commercial Fisheries
211 Mission Road
Kodiak, Alaska 99615

April 2002

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INTRODUCTION

The Alaska Department of Fish and Game (ADF&G) introduced sockeye salmon, *Oncorhynchus nerka,* into barren Hidden Lake (58° 23' N. latitude, 152° 42' W. longitude) on Afognak Island in July, 1992. The ADF&G strategy for this project is to use Hidden Lake for rearing juvenile sockeye salmon outstocked from Pillar Creek Hatchery. The Hidden Lake sockeye salmon smolt migrate to the ocean and return as adults to enhance the commercial fishery at Foul Bay in the Kodiak Management Area. All returning adult sockeye salmon are intended for harvest in the Foul Bay Terminal Harvest Area (FBTHA) fishery. An environmental assessment was prepared by the U.S. Fish and Wildlife Service (FWS), in cooperation with ADF&G, to comply with the Kodiak National Wildlife Refuge (KNWR) resource management guidelines.

From 1995 to 2001 initial returns to FBTHA from the Hidden Lake stocking project have averaged 24,943 sockeye salmon adults, (harvest numbers obtained from ADF&G fish ticket database in March 2002). The brood source used for this enhancement program is the early-run Afognak Lake sockeye salmon stock.

The Kodiak Regional Aquaculture Association funds this project. Evaluation and monitoring activities provided by ADF&G personnel include: weir operation, juvenile and adult sampling, commercial fishery monitoring and straying evaluation.

Study Area

Hidden Lake, the third largest lake on Afognak Island, is located approximately 70 kilometers northwest from the city of Kodiak on the northwest side of Afognak Island and lies within the boundaries of the KNWR (Figure 1). The lake is 4.4 km long and 0.6 km at the widest point with a total volume of 20.6 km^3, a surface area of 1.9 km^2, and a maximum depth of 43 meters. The lake drains into Hidden Creek, which is 2.4 km long and contains several falls impassable to anadromous fish. Hidden Creek empties into Foul Bay where the commercial fishery occurs.

Goals

The project goals are to evaluate sockeye salmon production from juveniles stocked into Hidden Lake and to comply with FWS environmental assessment requirements. This plan is intended to provide the field crew with the field operation procedures and data collection methods necessary to complete the established project goals.

Objectives

1. Estimate the relative abundance, age and size of sockeye salmon smolt emigrating from Hidden Lake.
2. Estimate the timing and strength of the adult sockeye salmon run to facilitate a commercial fishery in Foul Bay.
3. Determine the age composition and size of the adult sockeye salmon returns to the FBTHA.

Tasks

1. Conduct a hydroacoustic survey at Hidden Lake in late April or early May, prior to the sockeye salmon smolt emigration.
2. Establish a field camp at Foul Bay by 1 June.
3. Collect a minimum of 200 sockeye salmon smolt to estimate the average age (scales), size (weight and length), and condition factor throughout the emigration from 1 June to 30 June at Hidden Creek.
4. Install and maintain an adult sockeye salmon barrier weir in Hidden Creek from 1 June to 30 June (pink salmon will be passed through the weir).
5. Monitor the sockeye salmon build-up and commercial fishing activity in the FBTHA from 1 June to the end of June.
6. Collect 200 adult sockeye salmon scales and lengths per week; a minimum of 600 scales and lengths are needed to determine age composition in the commercial fishery in the FBTHA.
7. Collect physical data daily: air and water temperature, water height, cloud cover, wind direction and velocity, and precipitation at Foul Bay.
8. Write a brief project report summarizing the commercial fishing activity and data collected.

SUPERVISION

Project Biologist: Rob Baer

The Project Biologist will be responsible for providing logistical, technical, and equipment support for the field staff. Project biologist will ultimately be responsible for project reporting in the Regional Information Report series.

Field Staff: FTII -Shelly Lawson
FTI -Star Ames

Rob Baer and one assistant will conduct the spring hydroacoustic survey. The field crew will be responsible for other field operations. In addition, the field crew will be responsible for assuring that ADF&G's standard safety operating procedures are followed.

PROCEDURES

Spring Hydroacoustic Survey

In late April or early May, a hydroacoustic survey will be conducted at Hidden Lake to estimate the abundance of rearing sockeye salmon. The following procedures will be used to complete the survey. Pre-determined transects will be located using a global positioning system (GPS). Once each transect has been located, a light sensitive strobe light will be placed on shore to assist in locating the end of the transect. The boat will be prepared for the hydroacoustic survey by erecting a tarped shelter, securing the transducer and its frame to the hull, and setting up the hydroacoustic deck unit with the sonar configured laptop computer. Also, a flow meter will be attached to the transducer support to aid in maintaining the consistent transect speed of 1.5 meters per second. Lastly, the Visual Acquisition computer program (Appendix A) will be configured to the real time physical conditions of the lake (Appendix B).

Each survey will begin when it is dark enough to activate the strobes. A GPS will be used to obtain the starting point of each transect. If a GPS signal is unavailable, a point directly across the lake from the strobe lights will be approximated with the established limnological map. An electronic file name will be constructed for each transect consisting of a two letter lake code, month, year, and the transect number (i.e., Hidden Lake, April 1999 survey at transect #5; filename: hl049905). The transducer will be placed in the water before approaching the shore and the depth checked by turning on the sounder **(WARNING: the transducer must be in the water whenever the sounder is turned on or severe damage may result)**. The boat will be moved shoreward slowly until a depth of ~5 meters is reached, then turned toward the far shore to begin the transect. The strobe on the opposite shore will be used as a course point and the boat speed will be maintained at a constant rate of 1.5 meters per second. The computer display will be monitored to confirm proper conditions and settings are maintained. The skiff operator will announce the distance from shore periodically. In turn, the sounder operator will periodically announce the lake depth from the computer display. The transect will end when the depth reaches 2-5 meters, or the proximity to the shore prohibits continuing any further. This process will be repeated at each transect until the survey is completed.

The lake name, date, weather, temperature, transect number, direction traveled, actual start/finish times, file name and transducer depth for each transect will be recorded in a "Rite-in-the-Rain" logbook. A test or 'drift file' will be recorded over the deepest part of the lake to aid the analysis portion in detecting 'noise'. The same system settings that are used for the survey will be used for the drift file.

Surveys are often subject to weather conditions and may take multiple days to complete. Upon completion of a trip, all equipment will be cleaned, dried, and then stored in its appropriate location at the ADF&G warehouse. Gear maintenance and supply needs will be the responsibility of the assisting technician (supervisor will need to convey this). Data management and analysis will be the responsibility of the project biologist conducting the survey (Appendix C).

Sockeye Salmon Smolt Collection

In past years, fyke nets have been unsuccessful in capturing sockeye salmon smolt in Hidden Creek. Tidal influence caused fluctuations in water flow, making it difficult to keep the trap operable. In 2001, the field crew was successful in collecting smolt samples with a dip net on the upstream side of the barrier weir. A dip net or beach seine will be employed in the 2002 field season to capture sockeye salmon smolt. The dip net will be set on the creek bottom, upstream of the weir. The smolt are captured by lifting the net to the surface as they approach the opening of the net. If this method proves unsuccessful, beach seining in the estuary will be attempted. The captured smolt will be placed into a Kitoi Box (aluminum box with a perforated bottom) for AWL sampling. The method of smolt capture, location and number of sets attempted will be recorded on the *Daily Smolt Catch Reporting Form* (Figure 2).

Smolt Identification, Enumeration, and Condition

A tally counter will be used to make an accurate count of all smolt captured. Refer to the supplemental binder that contains identification keys if questions arise regarding species identification. The Project Biologist should be contacted if there are any questions regarding identification. Sockeye salmon smolt are easily stressed, so it is important to handle the smolt with care. Observations of excessive scale loss, lacerations, and/or mortality will be noted in the comments section on the *Daily Smolt Trap Catch Reporting Form* (Figure 2). Catch effort data and number sampled will be summarized on the *Sockeye Salmon Smolt Summary Form* (Figure 3).

Age, Weight, and Length Sampling

A minimum sample of 200 emigrating sockeye salmon smolt will be collected for age, weight, and length (AWL). However, every attempt should be made to collect ~120 smolt samples per week throughout the emigration period. If possible, samples should be taken from a single day's catch. A sampling day is the 24-hour period from NOON to NOON and will be identified by the calendar date corresponding to the first NOON.

Smolt that are collected will be kept alive and sampled the day of capture. Tricaine Methanesulfonate (MS-222) will be used to anesthetize the fish. Latex gloves will be worn to prevent direct exposure to MS-222 (review the Material Safety Data Sheet in the Kodiak office binder). Further training by the Project Biologist will occur in the field, if necessary. Attention will be given not to overexpose smolt to excessive doses of MS-222. The age, weight, and length data will be recorded on adult AWL forms (no smolt AWL forms exist). Refer to Appendix D.1-D.5 for instructions on how to properly sample smolt and record data onto an AWL form. The personnel collecting the data will be identified at the top of each AWL form. The green AWL forms will be used for the 2002 field season; do not use the out dated blue or red AWL forms. **It is critical to fill out the AWL forms correctly.**

A scalpel will be used to remove 5-10 scales from the preferred area of each smolt. The preferred area is located on the left side of the fish, where an imaginary line is visualized from the posterior edge of the dorsal fin to the anterior portion of the anal fin, 2 to 3 rows up from the lateral line (Appendix D.4). The scales will be mounted on a glass slide. The left portion of each slide will be labeled with the AWL number, sample location, date, species, and fish number (Appendix D.5). **The smolt lengths will be measured to the nearest millimeter from the tip of the snout to the fork of the tail.** Excess water weight will be removed from the smolt by placing the each smolt sample on a moist paper towel prior to weighing. **Individual smolt weights will be recorded to the nearest 0.1 gram.** After sampling, the smolt will be placed into a bucket of fresh water to recover from the anesthetic. The smolt will not be released to the creek until they are recovered from the anesthesia and regain normal swimming activity.

All data (forms) will be forwarded to the area office for review on a frequent basis (weekly or earliest available plane to town). The data will be duplicated in case originals are misplaced in transit. **Please be conscientious in the quality control of <u>all</u> data prior to sending into Kodiak. Take the time to thoroughly review slides and forms to see they are filled out properly. This is especially important for the computer AWL forms.**
These are some common mistakes:

1. Scales mounted poorly - avoid too many scales in a smear and avoid slime or debris when mounting; also, keep smears far enough apart to avoid mistaking one fish for another.
2. Numbering AWL forms improperly - for example, if 70 smolt are sampled in one day (day 1), the AWL numbers should be 001 (fish 1-40; 8 slides), 002 (1-30; 6 slides). The next day will start with AWL 003 (fish 1-40) and so on.
3. Damaged AWL form (computer - Mark sense) - do not bend, fold, tape, staple, paper clip, etc. these forms, otherwise the computer will not read them correctly.
4. AWL data not completely filled out for smolt – be sure to transcribe the litho code from the front of the form to the back of the form.
5. Filling bubbles on a stack of paper or AWL's - use a hard surface to fill out AWL forms, dimpling occurs if this is not done.

Adult Weir Installation

Once the camp is established, a barrier weir will be installed and maintained in Hidden Creek to prevent adult sockeye salmon from escaping into the creek. It is important to monitor the barrier weir and perform the following duties:

1. Pass pink salmon and other migrating fish through the weir.
2. Keep the weir clear of debris.
3. Check and clean the weir daily.

The weir will be located ~100 m upstream from the stream terminus. The weir is constructed with bipods, stringers, and aluminum panels. Eight bipods support the main section of the weir. The bipods consist of 3 meter long, 5.1 cm diameter aluminum pipes attached at the top using NU-RAIL RACKMASTER "A" fittings. The bipods are joined by 2.4 meter long, 5.1 cm diameter pipe as horizontal stringers using the RACKMASTER "T" or cross fittings. There are two horizontal stringers approximately 0.9 to 1.2 meters (3 to 4 ft.) apart on the upstream leg of each bipod. A single horizontal stringer will be placed on the downstream leg of each bipod.

The next step is to add the aluminum picket panels to the support structure. The panels vary in length, and need to be installed with the longest panels first starting on the south bank. All the panels will be wired or cable-tied to the legs and stringers and hose clamped together. Once the main portion of the weir is completed, a gate will be included in the weir to allow returning pink salmon to reach spawning grounds and to allow emigrating steelhead to enter the ocean. The gate consists of metal pipe pickets. Two 'L' shaped stringers supports the gate pickets. A double row of sandbags will be used to fill gaps between the bottom of the pickets and the creek bed on the up stream side.

Weir Maintenance

All debris will be raked or hand picked from the weir daily. The weir will be checked twice a day to ensure that there are no holes. Any modifications on the weir will be recorded in the log book and the project biologist will be notified.

Catch Sampling

Adult sockeye salmon catch in the FBTHA will be sampled for age (scale), sex, and length data with a weekly goal of 200 fish. **However, large numbers of the fish are typically harvested within the first few days of the fishery, sampling should be increased on these days.** The minimum sample goal for the season is 600 fish from 09 June through the end of the run at Foul Bay. Adult AWL data collection instructions are provided in appendices D.6-D.10.

Fishery Monitoring

In order to harvest sockeye salmon returning to Hidden creek, a commercial fishery is allowed in the FBTHA. This fishery opens at 1200 hours (NOON) on 09 June and continues, 24-hours a day, through 2100 hours 08 July. The commercial salmon fishery will be monitored in Foul Bay from 09 June to approximately 01 July (Figure 4). Daily surveys will be conducted in Foul Bay to assess sockeye salmon run strength with the information relayed to Area Management Biologists at 0800 and 2000 hour radio schedules (see Safety and Radio Schedule Section). The crew leader will be responsible for coordinating the opening of the fishery under direction of the Management Biologist. Throughout the fishery, record the fishing and tender vessel names, fishing location, and estimated catch, by species, each day on the *Fishery Monitoring Form* (Figure 5).

Physical Data

Physical data will be collected daily at the Hidden Creek weir site. Information recorded on the *Daily Physical Observations Form* (Figure 6) will include the following: water and air temperatures, water height, percent cloud cover, wind direction/velocity, and precipitation.

OTHER REQUIREMENTS

Safety and Radio Schedule

Safety is the highest priority of this project. State safety regulations and Standard Operating Procedures (SOPs) must be followed at all times. The field crew is responsible for assessing potentially unsafe situations and will err on the side of caution when considering safety issues. Employees not following state safety regulations may be subject to disciplinary action, including termination without warning.

Employees are expected to review and sign the following SOPs before beginning work:

111-700	Safety Policies and Standards;
111-710	Office/Warehouse Safety;
111-720	Field Camp Safety;
111-730	Aircraft Safety for Passengers;
111-740	Boating Safety;
111-750	Vehicle Safety;
111-760	Laboratory Safety;
111-780	Firearm/Bear Safety.

In addition, all employees are expected to hold a current First Aid/CPR certification. The Department will hold First Aid/CPR classes in Kodiak prior to the field season; if the employee is unable to attend the classes in Kodiak, obtaining the proper certification will be the employee's responsibility.

An approved personal flotation device will be worn at all times while boating. A survival kit including matches, VHF radio, flare gun, GPS unit, spare motor parts, and a first aid kit will be in the boat at all times.

Ultimately, each employee is responsible for his/her own safety.

Field camps will be contacted by Kodiak office personnel on the single side band radio (SSB). The frequency for Fish and Game contact is 3230 kHz. The morning radio schedule with the Kodiak Area Management Biologist will be from 0800 - 0830 hours seven days a week and the afternoon radio schedule with the Project Biologist will be from 1300 – 1315 hours Monday through Friday and on Sunday evening from 2000 - 2015 hours. If contact is necessary at other times, information can be relayed to the Kodiak office via SSB 3230 during normal working hours, 0800 – 1700, Monday through Friday. Emergency contact should first be attempted with ADF&G office staff. If there is a medical emergency after hours or office personnel cannot be contacted, contact the US Coast Guard on SSB 4125 or VHF channel 16. **ALL FIELD PERSONNEL WILL BE AWARE OF EMERGENCY CONTACT PROCEDURES POSTED ON EACH RADIO AND THE LONGITUDE AND LATITUDE COORDINATES WHERE THEIR CAMP IS LOCATED.**

Air Charters

All air charters will be set up through Kodiak staff. Appropriate information in regard to charters will be relayed through daily radio contact. It is important to contact office personnel when any data, equipment, or other freight is "back hauled" to Kodiak. It is also important to clearly label items to be "back hauled" with the proper destination.

Reporting

Crew leaders will be responsible for reporting all job activities and compiling biological data. Be sure to use a pencil rather than a pen for data entry. Data forms and a field log will be completed daily. Use "Rite-in-the-Rain" field log books in the field and transfer data onto standard data forms after fieldwork is completed. Data will be reported to Kodiak staff via radio. Completed data forms will be sent to Kodiak weekly. A report of project activities will be sent to town weekly or on the next available plane. A one page weekly report is sufficient (Appendix C). Data sent to Kodiak should be packaged in a large sealed envelope and labeled (i.e. Foul Bay data, to ADF&G attn: Rob Baer 486-1835).

Inventory

The crew leader is responsible for the proper maintenance, storage, and inventory of all project equipment. Appendix D describes the protocol to follow regarding equipment tracking, and storage. Upon completion of the project, the crew leader will complete an inventory of all project equipment. The final location of each inventoried item will be noted.

Video/Photo Documentation

The crew leader will be responsible for photo documentation of project activities. Specific aspects such as smolt collection, weir construction, and other complex tasks are important to photograph. When possible, State cameras and film will be used. If State cameras are not available, film will be provided for use with personal cameras. The use of personal cameras is suggested in this case but not required.

Timesheets

All timesheets are to be in the Kodiak office by the 15th and 30th of each month. Instructions of how to properly fill out a timesheet and an example of a properly filled out timesheet can be seen in Appendix E.1-E.2. Work activities should be scheduled to be completed in a 7.5 hour day. There are times in the field (high water events, etc.) when personnel need to work beyond the normal work-day to ensure project objectives are being met. However, an attempt should be made to contact the project biologist about overtime work.

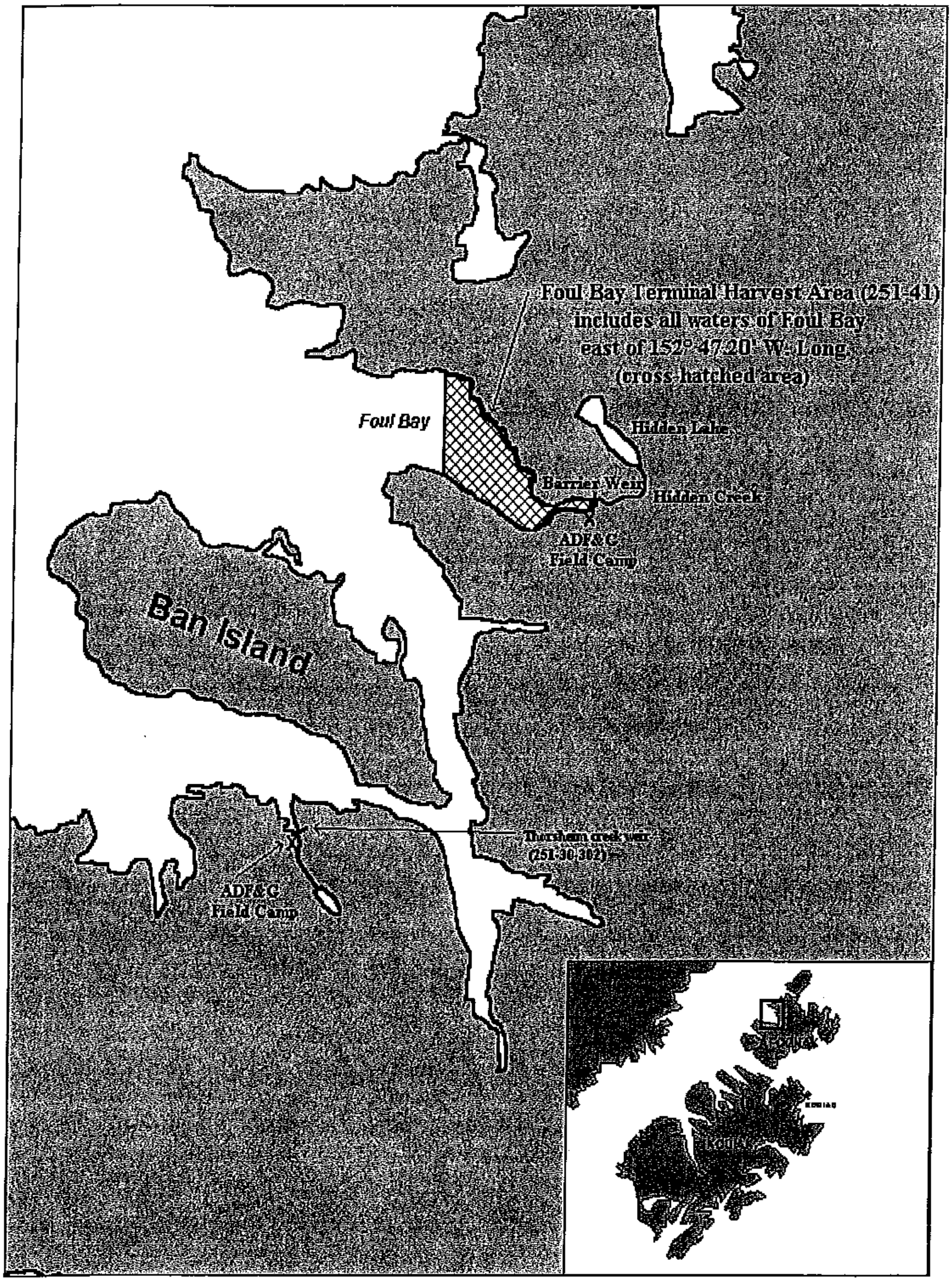


Figure 1. Location of Foul Bay Terminal Harvest Area, ADF&G field camps, and fish weirs at Hidden Creek.

DAILY SMOLT CATCH REPORTING FORM

page____of____

PROJECT: **HIDDEN** DATE ____________ TRAP LOCATION: ________________

TIME (military)	SOCKEYE SMOLT (numbers)					OTHER (numbers)						COMMENTS [2]
	CATCH [1]	EXAMINED FOR MARKS	MARKED RECOVERIES	TRAP MORTALITY	LIVEBOX MORTALITY	COHO	PINK	DOLLY V.	STICKLEB.	RAINBOW	OTHER	
TOTAL												

forms98.xls

[1] Catch number includes marked recoveries and mortality. Asterick weight based estimates and attach Catch Weight Worksheet.

[2] To be included in comments: significant water level changes, any difficulties determining marked fish, problems, observations.

Figure 2. Daily smolt catch reporting form.

SOCKEYE SALMON SMOLT SUMMARY FORM

page_____of____

PROJECT: **HIDDEN** YEAR:________ TRAP LOCATION:____________________

	NUMBER OF SMOLT									
	CATCH[2]			SAMPLED		# MARKED	MARKED RECOVERIES[4]		
DATE[1]	DAILY	CUMULATIVE	MORTS[3]	DAILY	CUM	RELEASED	DAILY	CUM	COMMENTS:

forms98.xls

1 Each date covers a 24-hour period extending from noon to noon and identifies the starting date.

2 Numbers of fish caught includes marked recoveries. Should equal CATCH: TOTAL on Catch Reporting Form.

3 Includes both trap and livebox mortality.

4 Reset after each release. Include Daily Marked Recoveries in the Daily Catch because they were previously counted.

Figure 3. Sockeye salmon smolt summary form.

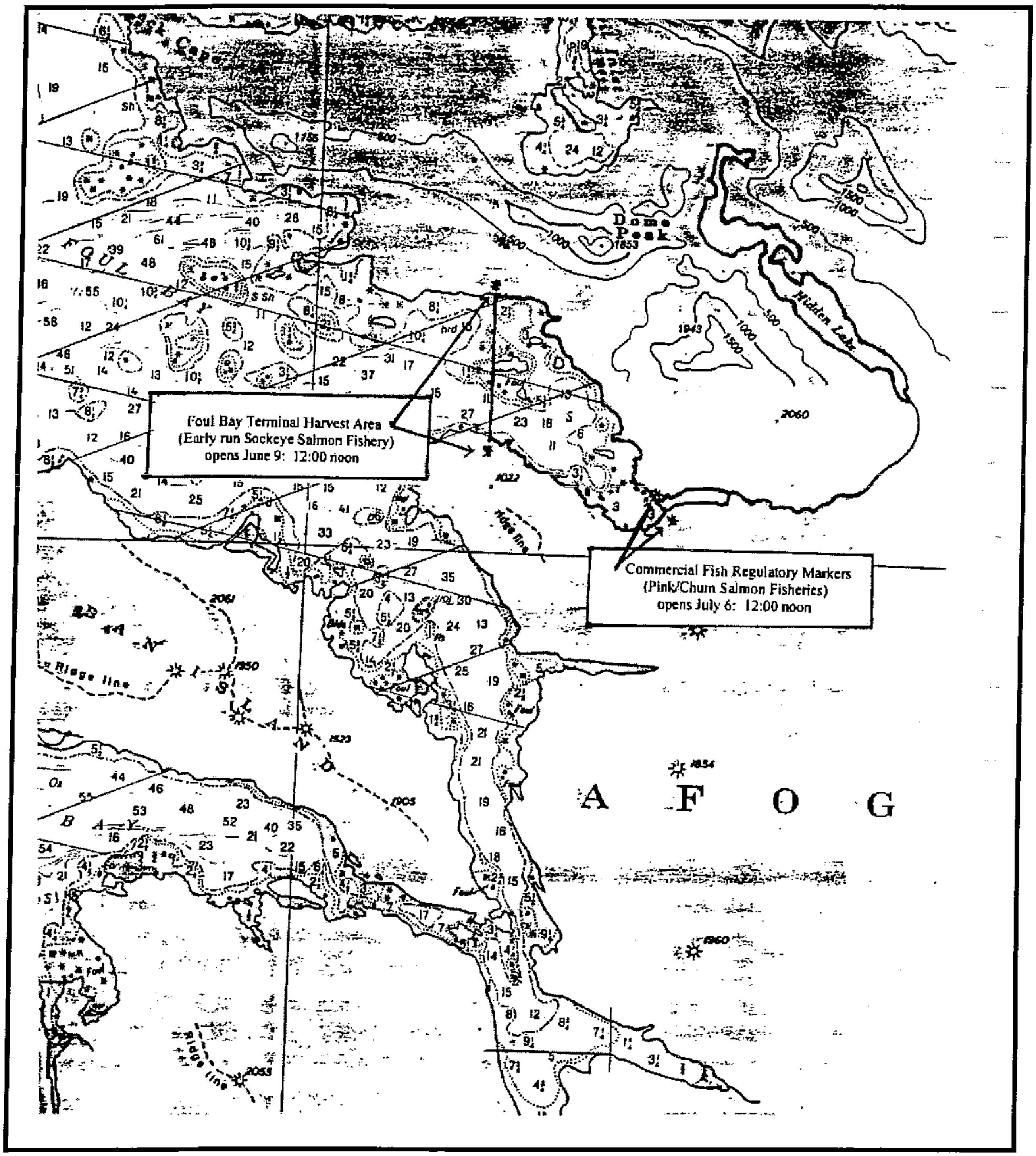


Figure 4. Location of the regulatory markers for the 09 June (sockeye salmon) and 06 July (pink and chum salmon) commercial fishing periods for Foul Bay.

FISHERY MONITORING FORM

			Estimated Harvest						
			Sockeye		Pinks		Chums		Other Species
Date	Number of Boats	Boat Names	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative	
Totals									

Figure 5. Foul Bay Terminal Harvest Area fishery monitoring reporting form.

DAILY PHYSICAL OBSERVATIONS

PROJECT **HIDDEN** YEAR__________ page____of____

			TEMPERATURE (C)		CLOUD COVER		VISIBILITY	WIND		GAUGE	
DATE	TIME	SITE[1]	Air	Water	Percent (%)	Ceiling	(mi)	Direction	Vel. (kts)	HEIGHT (cm)	COMMENTS (i.e., rain, drizzle, etc...)

[1] Weir Site = W; Smolt Site = S

forms98.xls

Figure 6. Daily physical observation form.

APPENDIX

Appendix A. Visual acquisition procedures.

---

1. **Open <VISUAL ACQUISITION> program.**
   -double click icon

2. **Open O-Scope window,**
   -drag & drop from right margin
   and turn on <AUTOMATIC TRACKING>.
   -right click in O-Scope window

3. **Enter temperature reading.**
   -Go to <VIEW>...<ENVIRONMENT>, or click on <ENV> button

4. **Configure data collection parameters.**
   -Go to <CHANNEL MENU>...<CONFIGURE>...<TRANSDUCER>
   -Check <SOUNDER INFORMATION> selected for <DUAL>
   -Set <START> and <STOP RANGE> (be sure STOP will exceed max bottom depth)
   -Enter a <THRESHOLD> (i.e. -70. dB)
   -Select <SQUARED>
   -Set <PULSE RATE> at 5 pps
   -Set <PULSE WIDTH> to 0.4 mS
   -Select <MONOTONE> for target collection
   DO <u>NOT</u> HIT <RUN> IF TRANSDUCER IS <u>OUT OF WATER</u>!!!

5. **Confirm <TVG> setting at 40 logR.**
   -Go to <DISPLAY SETTINGS>...<TVG>

6. **Open file name.**
   -Go to <FILE> menu...<SAVE AS>, or push <AS> button
   -Enter file name (as per standard convention)
   -Save file in appropriate folder

7. **<u>PUT TRANSDUCER IN WATER</u>, if not already.**

8. **Turn transducer on**
   -Go to <CHANNEL>...<RUN>
   and head toward transect start point (equivalent to "fin on").

9. **When ready to start transect begin logging to file** (equivalent to turning on DAT tape).
   -Go to <FILE>...<BEGIN LOGGING>

10. **Observe O-Scope window for targets and noise.**

11. **Watch bottom profile and end transect.**
    -Hit escape key, <ESC>, to end <RUN> and <STOP LOGGING>

12. **Turn away from shore, remove transducer from water, and head to next transect.**

13. **Repeat procedure from Step 6** (if program remains open).
    If program was exited repeat from Step 1.

Appendix B. Summary of visual analysis echo counting procedures.

---

1. Open file and set display settings
   - -Select 40 for TVG
   - -Narrow tranducer beam

2. Step 1 Analysis.
   - -Set up Bottom Tracking
   - -Set up Echo Recognition
   - -Set Reports/ Strata
   - -Set to Single Beam

3. Go....produce <*.csv> file and save.

4. Clip parts out of CSV file to Excel Worksheet, <ekocount.xls>.
   - -Total Ping Count
   - -Echo Pulse Rate (pps)
   - -Strata Depths
   - -Echo Counts per Stratum (Targets Found)
   - -Calculated Average Percent per Stratum

5. Duration In Beam
   - -Zoom to stratum's vertical height and work across stratum
   - -Measure number of Echoes per Fish
   - -Insert measurements into Excel Worksheet, <ekocount.xls>
   - -Repeat measurements for each stratum

6. Input Surface Area and other queried data in Excel Worksheet, <ekocount.xls>

Appendix C. Summary of visual analysis echo integration procedures.

---

1. Open file.

2. Step 1 Analysis.
   - -Set Bottom Tracking (besure to not include any bottom echo)
   - -Set Echo Recognition
   - -Set Reports/ Strata (same as Echo Counting settings)
   - -Set to Dual Beam

3. Go.....produce a <*.csv> file.

4. Clip out densities [average horizontal (FPUA)].

5. Average FPUA's for interested Reports (horizontal transect segments with high densities).

6. Multiply by surface area and add to remaining transect segments where Echo Counting was used.

Appendix D.1. Procedure for sampling salmon smolt for age-weight-length data.

AWL Forms

Use the green AWL forms; do not use the red or blue AWL forms because they are out of date. Smolt length is recorded on the front of the AWL form, and smolt weight is recorded on the back of the AWL form with a no. 2 pencil, sex and age group is left blank (Appendix D.2). Complete each section of the left side of the AWL form and darken the corresponding blocks. Be sure to transfer the Litho number from the front of the form to the back of the form.

Description: Include species (sockeye smolt), location, year, and samplers.

Card: The AWL forms and corresponding slides are numbered sequentially by date throughout the season starting with #001. A new, consecutively numbered form is used each day of sampling and for every 40 samples. There may be a minimum of one fish and a maximum of 40 fish (8 slides) per AWL form.

Species: Sockeye = 2.

Day, Month, Year: Use the appropriate digits with leading zeros for the date fish are sampled.

District, Subdistrict, Stream, Location: The following codes apply to Hidden Creek/FBTHA: District = 251, Subdistrict = 41, Stream = 406, Location = 044.

Period: List the period in which the fish were sampled (refer to Appendix D.3).

Project: Refer to the reverse side of the AWL form to obtain a code; code 8 for smolt.

Gear: Refer to the reverse side of the AWL form to obtain a code; 13 = dip net.

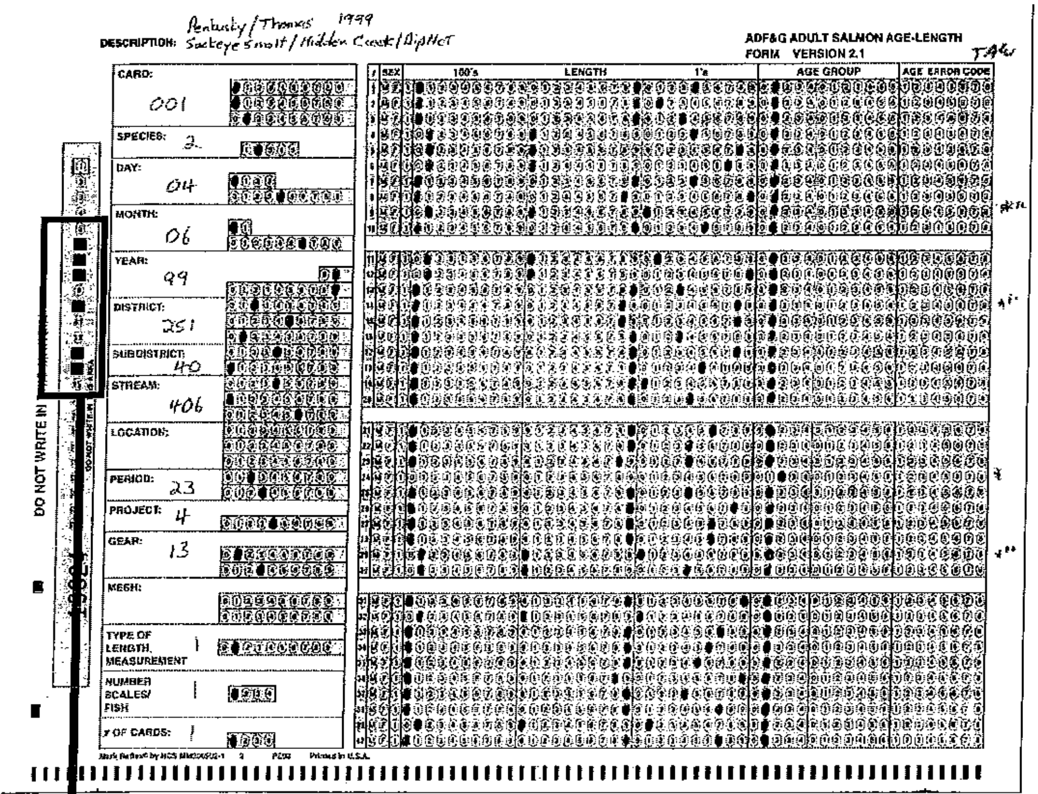
Mesh: Leave blank.

Type of Length Measurement: Refer to the reverse side of the AWL form to obtain a code; 1 = Tip of snout to fork of tail.

Number of Scales: A number 1 is used here as a default, many scales are taken from smolt.

# of Cards: Put a number 1. Keep litho codes in numerical order throughout the season and be sure to transfer the litho code from the front left side to the backside of the AWL form. These forms will be optically scanned and stray marks may be misinterpreted. It is the crew leaders responsibility to make sure that all forms are carefully edited before returning them to your supervisor.

Appendix D. 2. Example of an AWL form filled out for smolt sampled. (Note, age group is not to be filled in and project code for smolt is 8).


DESCRIPTION: Sockeye smolt / Hidden Creek / DipNet

ADF&G ADULT SALMON AGE-LENGTH FORM VERSION 2.1

CARD: 001

SPECIES: 2

DAY: 04

MONTH: 06

YEAR: 99

DISTRICT: 251

SUBDISTRICT: 40

STREAM: 406

LOCATION:

PERIOD: 23

PROJECT: 4

GEAR: 13

MESH:

TYPE OF LENGTH MEASUREMENT: 1

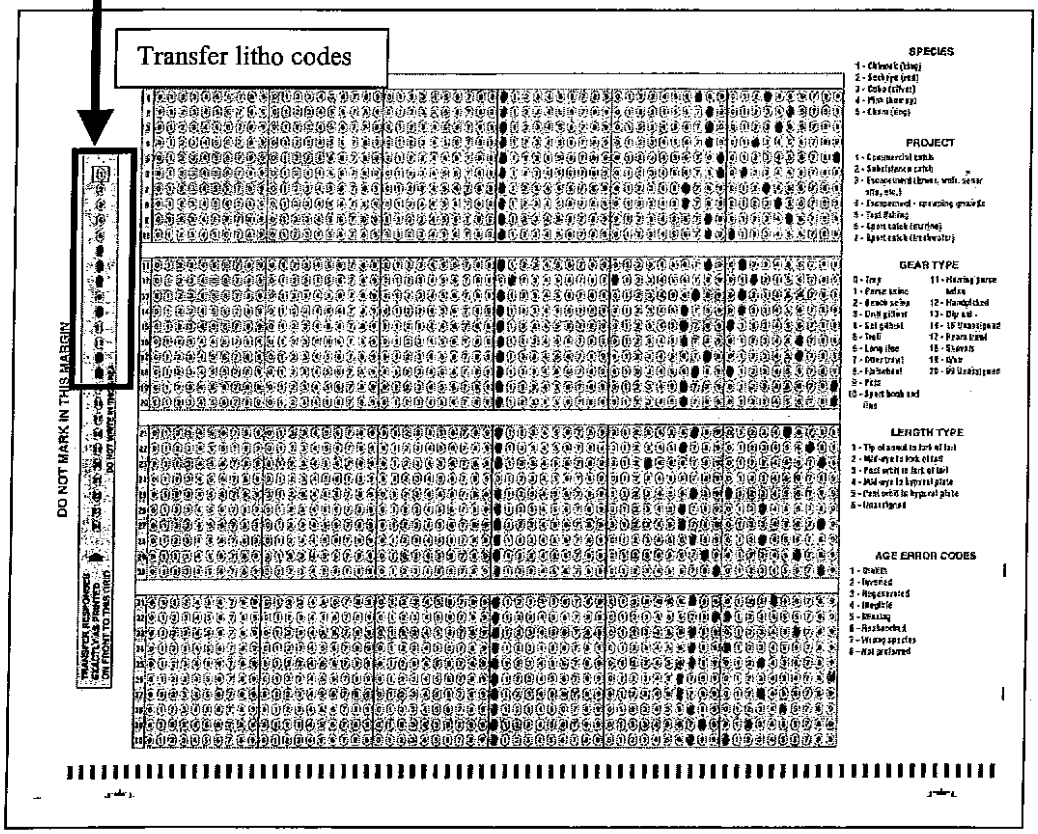
NUMBER SCALES/ FISH: 1

OF CARDS: 1

SEX | LENGTH (100's, 10's, 1's) | AGE GROUP | AGE ERROR CODE

DO NOT WRITE IN

Back side of AWL form


Transfer litho codes

DO NOT MARK IN THIS MARGIN

TRANSFER RESPONSES EXACTLY AS PRINTED ON FRONT TO THIS GRID

SPECIES

PROJECT

GEAR TYPE

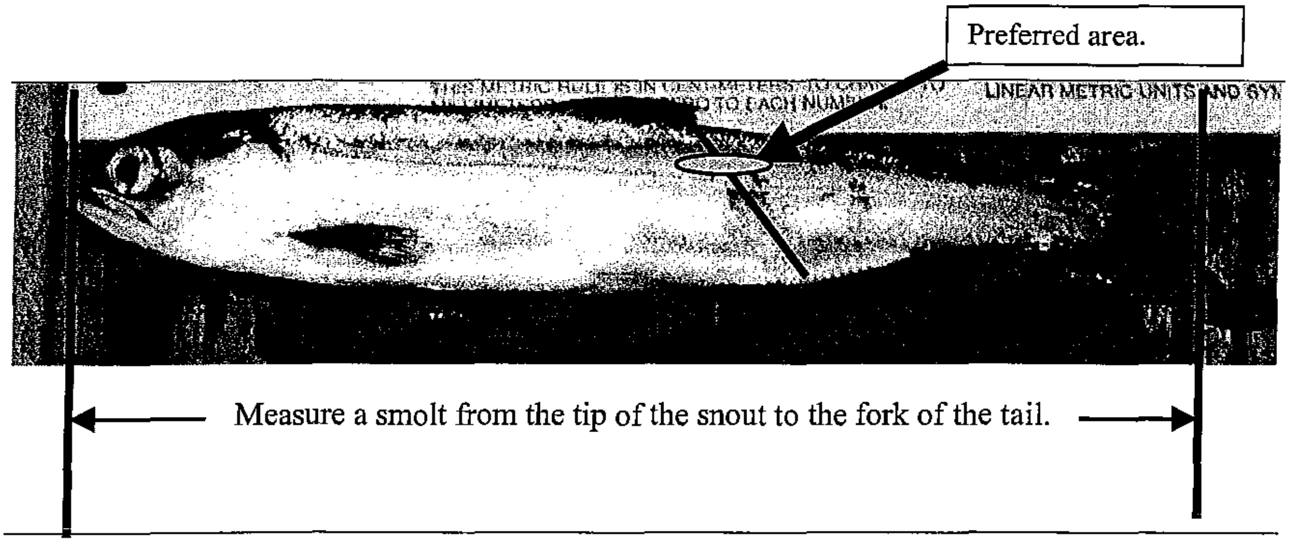
LENGTH TYPE

AGE ERROR CODES

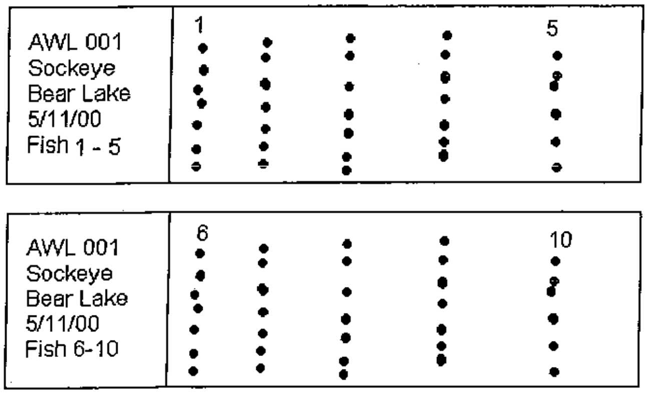
Appendix D.3. Period codes and corresponding dates for the period section on AWL forms.

Period	Dates	Period	Dates
1	01-Jan to 03-Jan	28	05-July to 11-July
2	04-Jan to 10-Jan	29	12-July to 18-July
3	11-Jan to 17-Jan	30	19-July to 25-July
4	18-Jan to 24-Jan	31	26-July to 01-Aug
5	25-Jan to 31-Jan	32	02-Aug to 08-Aug
6	01-Feb to 07-Feb	33	09-Aug to 15-Aug
7	08-Feb to 14-Feb	34	16-Aug to 22-Aug
8	15-Feb to 21-Feb	35	23-Aug to 29-Aug
9	22-Feb to 28-Feb	36	30-Aug to 05-Sep
10	01-Mar to 07-Mar	37	06-Sep to 12-Sep
11	08-Mar to 14-Mar	38	13-Sep to 19-Sep
12	15-Mar to 21-Mar	39	20-Sep to 26-Sep
13	22-Mar to 28-Mar	40	27-Sep to 03-Oct
14	29-Mar to 4-Apr	41	04-Oct to 10-Oct
15	05-Apr to 11-Apr	42	11-Oct to 17-Oct
16	12-Apr to 18-Apr	43	18-Oct to 24-Oct
17	19-Apr to 25-Apr	44	25-Oct to 31-Oct
18	26-Apr to 02-May	45	01-Nov to 07-Nov
19	03-May to 09-May	46	08-Nov to 14-Nov
20	10-May to 16-May	47	15-Nov to 21-Nov
21	17-May to 23-may	48	22-Nov to 28-Nov
22	24-May to 30-May	49	29-Nov to 05-Dec
23	31-May 10 06 June	50	06-Dec to 12-Dec
24	07-June to 13-June	51	13-Dec to 19-Dec
25	14-June to 20-June	52	20-Dec to 26-Dec
26	21-June to 27-June	53	27-Dec to 31-Dec
27	28-June to 04-July		

Appendix D.4. Photo of a smolt with the preferred area highlighted.



Appendix D.5. Salmon smolt glass slide example.



Appendix D.6. Procedure for sampling salmon adults for age-sex-length data.

AWL Forms

Use the greeen AWL forms; do not use the red or blue AWL forms because they are out of date. Adult length and sex data will be recorded on the front of the AWL forms and the back left blank (Appendix D.2). Using a no. 2 pencil, complete each section of the left side of the AWL and darken the corresponding blocks.

Description: Include species (adult sockeye), location, year, method of capture (purse seine, weir) and samplers.

Card: The AWL forms and gum cards are numbered sequentially by date throughout the season starting with #001. A new, consecutively numbered form is used each day of sampling. There may be a minimum of one fish and a maximum of 40 fish per AWL form.

Species: Refer to the reverse side of the AWL form to obtain species: sockeye = 2.

Day, Month, Year: Use the appropriate digits with leading zeros for the date fish are sampled.

District, Subdistrict, Stream, Location: The following codes apply to Hidden Creek/FBTHA: District = 251, Subdistrict = 41, Stream = 406, Location = 044.

Period: List the period in which the fish were sampled (Appendix D.3).

Project: Refer to the reverse side of the AWL form to obtain a code (commercial catch = 1).

Gear: Refer to the reverse side of the AWL form to obtain a code; 01 = purse seine.

Mesh: Leave blank.

Type of Length Measurement: Refer to the reverse side of the AWL form to obtain a code (2 = mid-eye to fork of tail). Measure the fish from mid-eye to the fork of the tail (Appendix D.8).

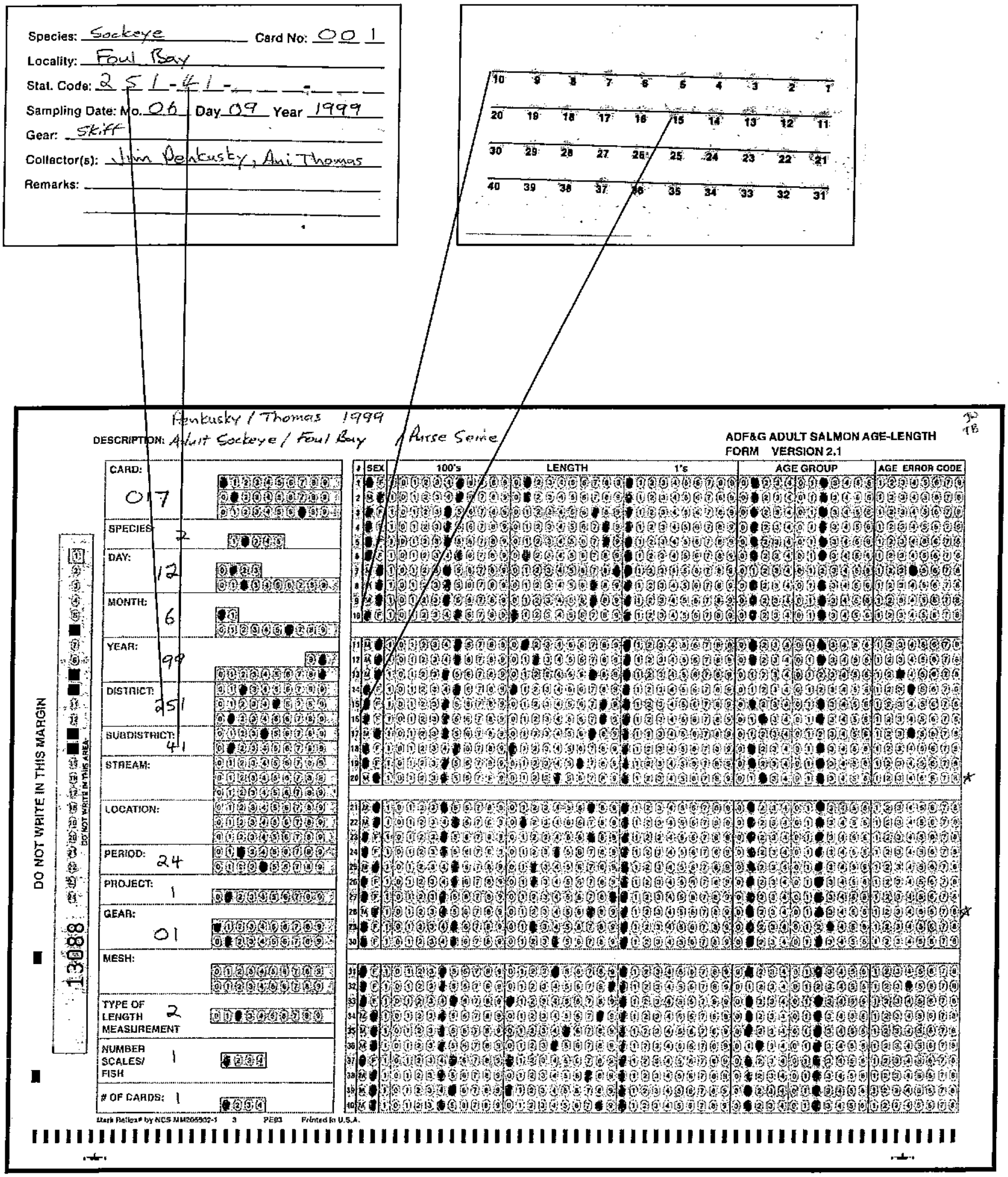
Number of Scales: Put a number 1 (refers to the column of scales per fish, which is one).

# of Cards: Put a number 1. Keep litho codes in numerical order throughout the season. These forms will be optically scanned and stray marks may be misinterpreted. It is the crew leaders responsibility to make sure that all forms are carefully edited before returning them to your supervisor.

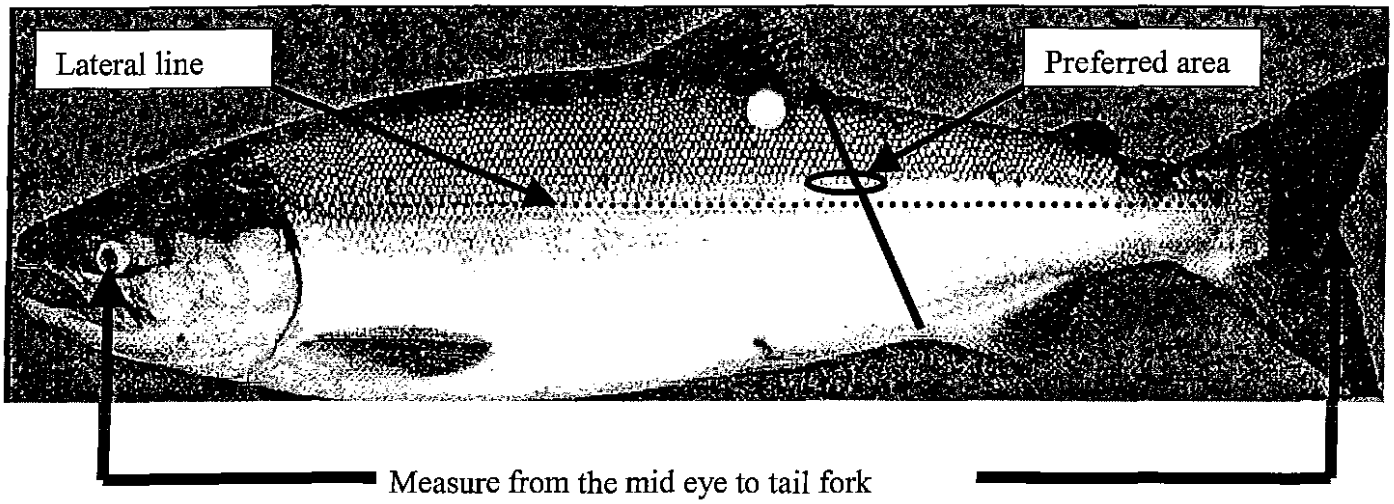
Appendix D. 7. Completed AWL (front side) and associated gummed card.

Front side of Gum Card

Back side of Gum Card



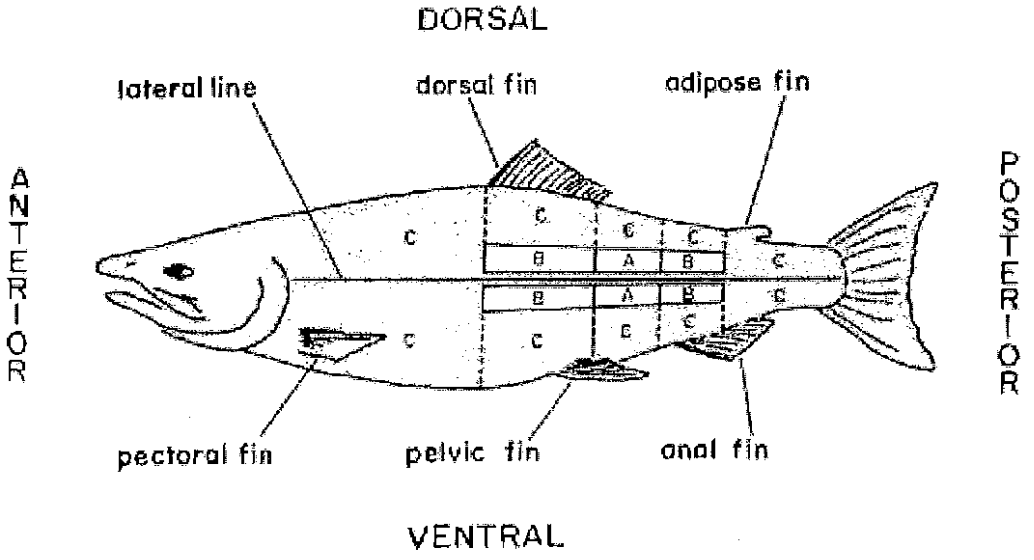
Appendix D 8. Measuring fish length mid eye to tail fork.



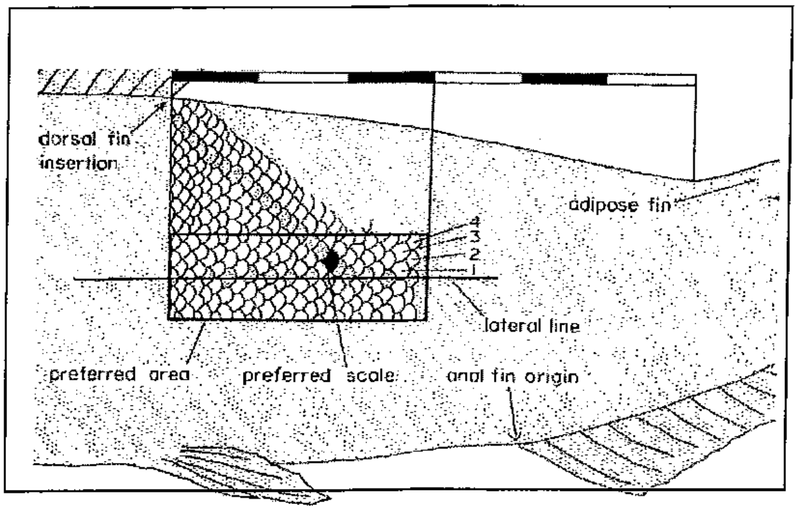
Mid eye to tail fork lengths are taken because the shape of the salmon's snout changes as it approaches sexual maturity. The procedure for measuring by this method is as follows.

1) Place the salmon flat on its right side (on the measuring board) with its head to your left and the dorsal fin away from you.
2) Slide the fish in place so that the middle of the eye is in line with the edge of the meter stick and hold the head in place with your left hand.
3) Flatten and spread the tail against the board with your right hand.
4) Read and record the mid eye to tail fork length to the nearest millimeter.

Appendix D. 9. Removal and mounting of the preferred scale.

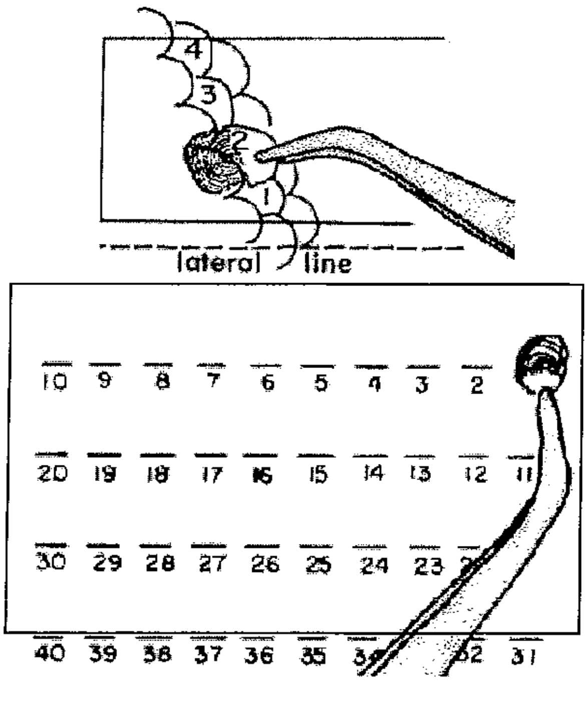


INPFC rated areas for scale removal. Area A is the preferred area. Area B is the second choice if there are no scales in area A. Area C designates non preferred areas. If scales on the left side are missing, try the right side.

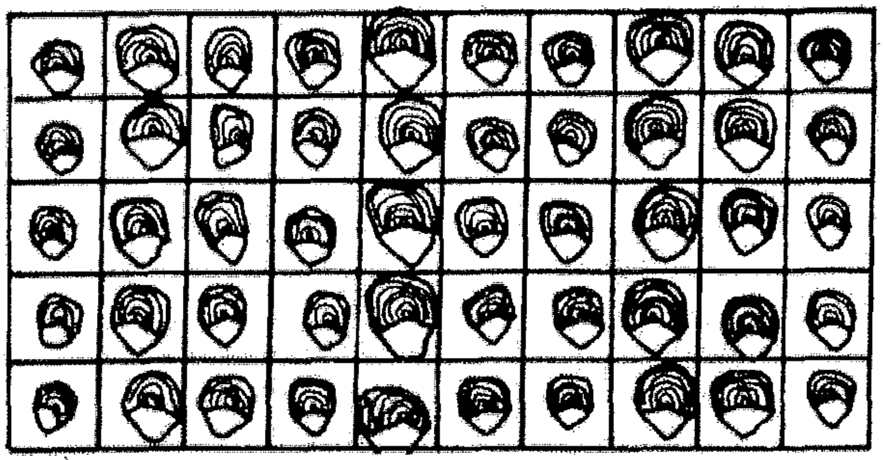


The preferred scale in this diagram is solid black. It is located 2 rows up from the lateral line, on a diagonal from the insertion (posterior) of the dorsal fin "back" toward the origin of the anal fin.

Do not turn scale over.

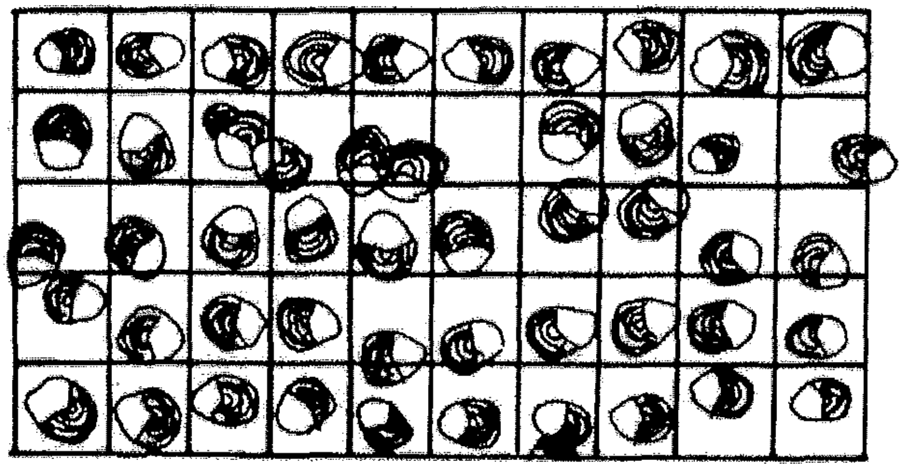


Appendix D. 10. Scale orientation on the gummed card.



CORRECT

The scales are all correctly oriented on the card in the same direction, with the anterior portion of the scale pointed toward the top of the card.



INCORRECT

The scales are incorrectly oriented in different directions. This increases the time spent to age samples.

Appendix E. Weekly Report Format.

To: Steve Honnold
ADF&G, Area Development Biologist
Kodiak, Alaska

Date: August 1, 1996

From: Millie Gray
ADF&G, FT-III
Kitoi Hatchery

Subject: Weekly Report

Little Kitoi Smolt Enumeration & Sampling

Pulled the fyke net trap today (8-1-96) ending the count for July 31, 1996. For the last five days there have been only sticklebacks passing through the counter. As to date this brings our estimated sockeye total to 88,925. The total sampled have been 1,116 (AWL 001 to 044). Total clips found were 515 of which 201 were right ventral, 313 were adipose/ right ventral and 1 was left ventral clip.

Little Kitoi Adult Enumeration & Sampling

Adult numbers have continued to slow down through out the week with the jack ratio remaining about the same. The overall percent of jacks is at 52%. Thus far I have found 70 marked fish. Most have been jacks, with 69 being RV and 1 LV. Lots of pinks milling around in Little Kitoi Bay with very few sockeye seen today.

Hatchery

7-30-96 Completed Chum salmon eggtake with a total of approximately 30 million eggs being collected. I sampled a total of 800 fish through out the eggtake.
7-30-96 The new aluminum boat was moved up into Little Kitoi Lake.

Commercial Fisheries

7-29-96 Fisheries opened in Kitoi Bay at noon and closed at 6 p.m. There was 1 tender and 2 boats fishing. A total of approximately 55,000 lbs of fish were harvested. Of those approximately 250 lbs were sockeye salmon and 50 lbs were coho salmon. I was able to collect 7 lengths and scales off sockeye.

Miscellaneous

7-31-96 Did a survey of Little Kitoi Lake to try and locate any of the sockeye. I saw 1 small jack by the outlet of the creek behind the island. I also started a survey of the middle basin (station #3) to determine at what depth the hydrogen sulfide chemocline exists.

Anticipated Activities

Monitor smolt counter at Little Kitoi.
Monitor and enumerate adult weir at Little Kitoi.
Sample adult sockeye at Little Kitoi.
Monitor the commercial fishery when opened in Kitoi Bay.
Continue with mapping of hydrogen sulfide in Little Kitoi Lake.

Appendix F.1. Instructions for filling out a timesheet.

Timesheets

Field camp personnel have not been filling timesheets out properly. So, this is an instructional on how to properly fill out a timesheet. When a flight comes out to drop off groceries or for any other reason and the flight comes at or near the end of a pay period, camp personnel need to send in their timesheets and an activity report. Fill in the time sheet up to the day you send them in and attempt to project your remaining hours worked.

Pay period: pay periods start on the 1st or 16th of each month and end on the 15th or end of the month (example: June 1-15 or June 16-30).

SSN: your social security number

Name: you guessed it!

Division: Commercial Fish

Day: Monday, Tuesday, etc.

Date: 6/16, 6/17, etc.

Time: start and stop time

Code 1: fill in the number of hours worked for that day (see example).

Work hours total: should be the same number as code 1.

Totals: the code 1 and work hours total columns need to be totaled (see example). If your time sheet is sent in before the end of the pay period, project your time for the remaining days so you can total your columns.

Comments: Leave blank, this section will be filled in town.

Employee's signature and date: You know what to do there.

Crew leaders take the time to look over the crew members timesheet before sending them into town to ensure that they are properly filled out.

Appendix F.2. Example of a completed timesheet.

Pay period ending: 3/15/00 SSN: Your SSN Name: Your Name Division Commercial Fisheries

Record times in military format. Example: 6:00 p.m. = 18:00. If you work past midnight, stop at 23:59 and resume at 00:01 the next day.

Day	Date	Start	Stop	Start	Stop	Start	Stop	Start	Stop	Start	Stop	Leave Taken		Sea Duty	Standby	Hazard	Code 1	Code 2	Code 3	Code 4	Holiday/ Leave	Work Hrs Total
Wed	3/1	8:00	12:00	13:00	16:30	18:00	22:00										11.50					11.50
Thu	3/2	8:00	12:00	13:00	17:30												8.50					8.50
Fri	3/3											H	7.50				7.50				7.50	
Sat	3/4	10:00	12:00	13:00	14:00												3.00					3.00
Sun	3/5																					
Mon	3/6	8:00	12:00	13:00	16:30												7.50					7.50
Tue	3/7	8:00	12:00	13:00	16:30												7.50					7.50
Wed	3/8	8:00	12:00	13:00	17:30												8.50					8.50
Thu	3/9	8:00	12:00	13:00	16:30												7.50					7.50
Fri	3/10	8:00	12:00	13:00	16:30												7.50					7.50
Sat	3/11																					
Sun	3/12	9:00	12:00														3.00					3.00
Mon	3/13	8:00	12:00	13:00	16:30												7.50					7.50
Tue	3/14	8:00	12:00	13:00	16:30												7.50					7.50
Wed	3/15	8:00	12:00	13:00	16:30												7.50					7.50
TOTALS															0.00	0.00	94.50	0.00	0.00	0.00	7.50	87.00

EXAMPLE

	Charge to:		
	Notation	CC/LC	%
1		11340033/11340033	100%
2			
3			
4			
		Total	100%

	Comments		Comments
3/1		3/9	
3/2		3/10	
3/3	Holiday not worked	3/11	
3/4		3/12	
3/5		3/13	
3/6		3/14	
3/7		3/15	
3/8			

We certify that the information provided above is true and correct.

Employee's Signature **Date:**

Supervisor's Signature **Date:**

Approving Officer Signature **Date:**

Holiday, Leave, Overtime and Premium Pay Overrides

**Codes	Hours	CC/LC
Leave & Holiday	7.50	No code needed for Leave & Holiday

KITOI EVALUATION PROJECT
OPERATIONAL PLAN, 2002

By
Stephen T. Schrof

Alaska Department of Fish and Game
Division of Commercial Fisheries
211 Mission Road
Kodiak, Alaska 99615

April 2002

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

INTRODUCTION

A late run sockeye salmon *Oncorhynchus nerka* brood stock development program using Upper Station Lake stock was initiated at the Kitoi Bay Hatchery on Afognak Island in 1989 (Figure 1). The goal of this program was to establish a brood source for the Spiridon Lake sockeye salmon enhancement project at Little Kitoi Lake. An underyearling (age-0) release program was the first strategy employed to supply juveniles for the Spiridon stocking program. This stocking strategy proved unsuccessful and was discontinued in the mid-1990s. Alterations to the release program were attempted throughout the 1990s to provide sockeye salmon for the egg takes, but the changes were unsuccessful. In 1998, late run Upper Station Lake stock sockeye salmon were released into Little Kitoi Bay for the last time.

In the spring of 1999, the out stocking program was changed to Saltery Lake stock sockeye salmon releases (presmolt) into Little Kitoi Lake. Program goals continue to be the development of a brood stock that will return to Little Kitoi Lake and provides eggs for the Spiridon Lake stocking project. The Saltery Lake stock exhibits a run timing that will minimize the interception of brood stock during the Kitoi Area commercial fisheries (McCullough et al. 2000). Changes in the sockeye salmon brood stock from Upper Station to Saltery Lake stock required the Alaska Department of Fish and Game (ADF&G) personnel to close the fish pass restricting access of returning Upper Station sockeye salmon into Little Kitoi Lake. Restricting the Upper Station Lake sockeye salmon was necessary to reduce predation on the forage base in Little Kitoi Lake.

A sockeye salmon stocking program was implemented at the Jennifer Lakes from 1994 to 1997 (Figure 2). The stocking program was intended as a high value supplemental catch to the pink salmon *O. gorbuscha* fishery. Stocking was discontinued after 1997 to simplify estimates of Little Kitoi Lake sockeye salmon survival. Coho salmon *O. kisutch* have been stocked into the lakes, since 1992. Current plans are to continue coho stockings in 2002 to lower Jennifer Lake.

Sockeye salmon were first introduced into Ruth Lake in 1956. Prior to 1996, Ruth Lake was last stocked in 1963. Late run Saltery Lake sockeye salmon fry were stocked into Ruth Lake from 1996 through 2000 to provide supplemental catch in the fisheries near the hatchery (Figure 2). Stocking of sockeye salmon was discontinued after 2000, due to low zooplankton levels observed in the 2000 samples collected. In addition, coho salmon were stocked into Ruth Lake in 1995, and 1997-2000. Coho fry were not stocked into Ruth Lake in 2001, however, plans are to stock coho fry in 2002.

Pink (starting in 1973), chum *O. keta* (1982), and coho (1990) salmon have been released annually at Kitoi Bay Hatchery. Pink (September), chum (July), and coho (October) salmon brood stocks are collected annually from Big Kitoi Creek. The hatchery has released up to 170 million pink salmon fry, 22 million chum salmon fry, and 900 thousand coho salmon smolt, annually. Similar stocking levels are planned for 2002. These fish provide substantial commercial harvest opportunities in the Kitoi, Izhut, and Duck Bay Sections in the Kodiak Management Area.

Limnology and oceanography sampling has occurred at the aforementioned lakes and Kitoi Bay to assess primary and secondary productivity (ADF&G 2000). The data collected have been used to plan stocking levels and the timing of releases. Little Kitoi Lake has been assessed more rigorously than the other sites, due to the discovery of an anoxic hydrogen sulfide layer in the deep portions of the lake. The majority of this anoxic layer was siphoned from the lake via a pipeline from 1996 to 1997, which substantially improved the productivity of the lake. Limnology and oceanography monitoring will continue at all sites in 2002.

Goals

The goals of the Kitoi Bay Evaluation Project are:

1. to estimate the number and condition of sockeye salmon smolt produced by hatchery stocking projects in the Kitoi Area;

2. to estimate sockeye salmon harvests and age composition of adult chum and sockeye salmon; and

3. to assess the primary and secondary production of three Kitoi area lakes and Kitoi Bay.

Objectives

1. Estimate the sockeye salmon smolt emigration from Little Kitoi Lake.

2. Estimate the survival of the sockeye salmon presmolt stocked into Little Kitoi Lake.

3. Estimate the average age, weight, and length (AWL) composition of the sockeye salmon smolt emigrating from Little Kitoi Lake.

4. Collect baseline age and growth data from sockeye and coho salmon smolts reared at Kitoi Bay Hatchery.

5. Document hatchery outstocking and fry marking activities provided by hatchery personnel.

6. Monitor salinity, temperature, and plankton bloom data in Kitoi Bay during the saltwater rearing period for juvenile pink, chum, and coho salmon.

7. Estimate the average age composition, length, and sex ratio (ALS) of sockeye salmon returning to the Kitoi Bay area and estimate the ratio of marked to unmarked fish to estimate survival of the different life stages stocked.

8. Estimate the age structure of Big Kitoi Lake chum salmon caught in the commercial fishery.

9. Evaluate the sockeye salmon forage base (zooplankton) at Little Kitoi, lower Jennifer, and Ruth Lakes.

10. Monitor water quality parameters in Little Kitoi Lake.

Tasks

1. Install and operate a fyke trap (8 May - 28 June) at the Little Kitoi Lake compound.

2. Enumerate the daily Little Kitoi Lake smolt emigration by species, and examine for fin-clipped sockeye salmon.

3. Randomly sample 210 sockeye salmon smolt per week for AWL data at the Little Kitoi Lake outlet.

4. Examine approximately 10% of Little Kitoi Lake sockeye salmon smolt emigration for fin clips and collect a 'select sample' from as many marked sockeye salmon smolt as possible.

5. Collect physical data daily: air and water temperature, percent cloud cover, wind direction and velocity, precipitation and water level.

6. Sample 200 sockeye and 200 coho salmon smolt for AWL data prior to release from hatchery raceways.

7. Document hatchery releases of sockeye, pink, chum, and coho salmon juveniles, including dates, location, and size at release.

8. Conduct a hydroacoustic survey (August) to determine rearing abundance of juvenile sockeye salmon at Little Kitoi Lake.

9. Collect weekly salinity and temperature measurements from three sites and plankton samples from three sites in Kitoi Bay during saltwater pen-rearing operations.

10. Restrict sockeye salmon escapements into Little Kitoi Lake and collect ALS data from adult sockeye salmon in the sport fishery and chum brood stock collection.

11. Prevent straying of sockeye salmon from the Little Kitoi fish pass by maintaining lake discharge.

12. Monitor the commercial salmon catch in Kitoi Bay, recording vessel names, tenders, delivery points, and estimated area catch by species.

13. Monitor the Kitoi Bay sport and subsistence fisheries, estimate harvests by species, and record the number of marked sockeye salmon.

14. Collect ALS data (600 scale samples) from the commercial chum harvest.

15. Collect limnology data from Little Kitoi and Ruth Lakes, including 1-m water samples at Little Kitoi Lake only, at six-week intervals from mid May through late September (minimum of four sampling events).

16. Build summary tables of project data (e.g. emigration timing) and complete an annual field report.

SUPERVISION

Project Biologist: Steve Schrof

The project biologist will provide supervision and technical support during the smolt emigration portion of the project. The Hatchery Manager will oversee the project after the smolt migration.

Fishery Technician III: Wes Ghormley

The fishery technician III will schedule daily tasks, oversee field operations and follow the ADF&G and Kitoi Bay Hatchery SOP's from May through June. The technician will coordinate activities with the hatchery management staff to ensure duties associated with salmon production monitoring are completed as outlined in this Operation Plan.

SMOLT

Sockeye Salmon Smolt Estimates and Trapping

A smolt trap will be installed on 8 May in the compound at Little Kitoi Lake outlet (statistical area 252-32-323) to enumerate all emigrating smolt. A dip net will be used to remove, count and identify salmon smolt from the holding box. A tally wacker will be used to assure an accurate smolt count. The daily sockeye salmon smolt tally will be recorded on the SOCKEYE SALMON SMOLT SUMMARY FORM (Figure 3). All daily catches including any mortalities will be counted and recorded on the DAILY SMOLT TRAP CATCH REPORTING FORM (Figure 4). Sockeye smolt will also be examined for the following type of fin-clips: Right Ventral, Adipose-RV, Left Ventral, Adipose-LV. The number of sockeye salmon smolt examined and observed with a clipped fin will be recorded on the MARKED FISH REPORTING FORM (Figure 5).

Age, Weight, and Length Sampling of Sockeye Salmon Smolt

From 8 May through 28 June, 70 sockeye salmon smolt will be sampled during a three-day period each statistical week (210 per week) for AWL data from Little Kitoi Lake outlet (Appendix A.1-A.2). In 2002, the statistical week runs from Friday through Thursday (Appendix A.3). Each sample taken from the trap catch should be attributed to the appropriate smolt date. A single sampling day will be the 24-hour period from noon to noon and identified by the calendar date corresponding to the first noon. Samples will not be mixed between smolt days. If less than 70 fish are caught in a day, the sample size for that day will be the number of fish caught on that day. The remaining number of sockeye salmon smolt to reach 70 samples will be collected and sampled the following day (s).

Smolt sampled on the day of capture will be transported in a clean 5-gallon bucket to the sampling area. Another bucket will be used as a recovery bucket. Both buckets will be aerated. Tricaine Methanesulfonate (MS-222) will be used to anesthetize the fish. Latex gloves will be worn to prevent direct exposure to the anesthetic. A small portion (thumbnail amount) of MS-222 will be dissolved in approximately 2 liters (L) of water. The amount of anesthetic will vary depending on water temperature and freshness of the chemical. A few smolt will be placed in this solution until subdued to a point where they can no longer flex their axial musculature but can still ventilate their gills. The strength of the chemical solution should immobilize the smolt in approximately 2-3 minutes.

Smolt will be measured from the tip-of-the-snout to the tail fork and recorded to the nearest millimeter (mm). Excess water will be removed from the smolt before weighing by using a paper towel as a blotter. All surfaces contacting smolt will be damp. Individual smolt weights will be recorded to the nearest 0.1 gram (g). A knife or scalpel will be used to remove 5-10 scales from the preferred area (Appendix A.4). The scales will be mounted on a glass slide by aligning 6-12 scales in a vertical row for each fish sampled (Appendix A.5). Scales from five fish will be mounted on each slide. The left portion of each slide will be labeled with AWL number, sample location, species, date, and inclusive fish numbers. After sampling, the fish will be moved to a recovery bucket containing freshwater. Sampled smolt will be released downstream of the smolt trap, once they have recovered.

In 2002, there will be two simultaneous sampling strategies employing a random sample of all sockeye salmon and a 'selected' sample of only marked smolt. The purpose of the random sample is to get an accurate representation of the emigrating population. It is essential that the sample be taken randomly which will include both marked and unmarked sockeye salmon smolt. In the event more than the required sample size is in the smolt trap at the time of sampling, the trap will be "stirred" to assure randomness. When the smolt are randomly distributed, a small dip net should be used to remove a sub-sample. This procedure needs to be repeated until the sample goal is met. When documenting marked smolt in the random sample indicate marked smolt and type of clip on the AWL forms.

The purpose of the selected sample is to collect mark-specific data. The "select" sample will include only marked fish <u>not</u> sampled in the regular AWL sampling. The selected sample needs to have an AWL numbering system independent of the random sample. Marked fish will be entered on the same AWL series regardless of particular fin clip; however, detailed records of individual markings will be maintained.

AWL data will be collected and recorded in a notebook dedicated to smolt sampling. Data will need to be transferred onto AWL forms. Personnel collecting the data need to record their names on the AWL form.

All data (slides, forms) will be forwarded to the project biologist in town to be reviewed on a frequent basis (weekly or earliest available plane to town). Be sure to duplicate the data forms in case originals are misplaced in transit. **Please be conscientious in the quality control of <u>all</u> data prior to sending into Kodiak. Take the time to thoroughly review slides and forms to see they are filled out properly. This is especially important for the computer AWL forms.**

Raceway Rearing Smolt Samples

As sockeye salmon presmolt (in August) and coho salmon smolt (in May) reach their target size for release (this will be determined by hatchery personnel), 200 individuals of each species will be sampled for AWL data. Sampling guidelines previously outlined in the *Age, Weight, and Length Sampling* section will be followed, including random sampling from all raceways. **This activity needs to be coordinated with the hatchery staff to assure that proper hatchery procedures are followed.**

Hydroacoustics Survey

A hydroacoustic survey will be conducted at Little Kitoi Lake in August to estimate the abundance of rearing sockeye salmon. The following procedures will be used to complete the survey. Transects will be established using a global positioning system (GPS) sensor. Light sensitive flashers will be placed on shore, during daylight, to assist the boat operator in locating the end of each transect. The boat will then be prepared for the hydroacoustic survey by erecting a tarped shelter, securing the transducer and its frame, and setting up the hydroacoustic deck unit with the configured laptop computer. Also, a flow meter will be attached to the transducer support to aid in maintaining the correct transect speed of 1.5 meters per second. Lastly, the Visual Acquisition computer program (Appendix B) will be configured to the real time physical conditions of the lake.

Each survey will begin when it is dark enough to activate the flashers. A GPS will be used to obtain the starting point of each transect. If a GPS is unavailable, a point directly across the lake from the flasher will be approximated with the established bathymetric map. An electronic file name will be constructed for each transect consisting of a two letter lake code, month, year, and the transect number (i.e., Little Kitoi Lake, August 2002 survey at transect #5; filename: LK080205). The transducer will be placed in the water before approaching the shore and the depth checked by turning on the sounder. **(WARNING: the transducer must be in the water before the sounder is turned on or severe damage to the transducer may result)**. The boat will be moved shoreward slowly until a depth of 1 to 3 meters is reached, then the skiff will be oriented towards the far shore to begin the transect. The flasher on the opposite shore will be used as a course point and the boat speed will be maintained at a constant rate of 1.5 meters per second. The computer display will be monitored to confirm adequate settings. The skiff operator will announce the distance from shore periodically. In turn, the sounder operator will periodically announce the lake depth from the computer display. The transect will end when the depth reaches 2 to 5 meters, or the proximity to the shore prohibits continuing any further. This process will be repeated at each transect until the survey is completed.

The lake name, date, weather, temperature, transect number, direction traveled, actual start/finish times, file name and transducer depth for each transect will be recorded in a "rite-in-the-rain" logbook. A 'drift file' will be recorded over the deepest part of the lake to aid in reducing 'noise'. The 'drift file' allows the operator time to check the equipment and settings prior to the actual survey. The system settings that are used for the survey will be used for the drift file. Upon completion of a trip, all equipment will be cleaned, dried, and then stored in its appropriate location at the ADF&G warehouse. Data management and analysis will be the responsibility of the project biologist conducting the survey (Appendix C).

Salinity, Temperature, and Plankton Monitoring

Plankton sampling will take place at three stations in Kitoi Bay (Figure 2). Plankton samples will be collected weekly, by conducting two replicate vertical tows at a speed of 0.5 m/s, using a Kitahara-type quantitative plankton net. The contents will be decanted into a poly bottle for analysis at the hatchery. Samples will be transferred at the hatchery to graduated cylinders to settle. Following 24 hours of settling, the volume of phytoplankton and zooplankton will be measured.

Salinity and temperature data will be collected weekly from the three zooplankton stations within Kitoi Bay (Figure 2) during the juvenile salmon saltwater pen rearing period. Data will be collected at half-meter intervals from the surface to 5 m, and then at 1 m intervals to 20 m.

Salinity, temperature and plankton data will be recorded on TEMPERATURE, SALINITY AND ZOOPLANKTON SAMPLING FORM (Figure 6).

ADULT SALMON

Little Kitoi Lake Fish Pass

Sockeye salmon will not be allowed into Little Kitoi Lake in 2002. This is to prevent non-Saltery Lake stock sockeye salmon from spawning in the lake. However, water discharge from the lake needs to be kept sufficient throughout the season to attract adult salmon and prevent straying of sockeye salmon to other systems until they can be harvested. The fish pass will also be opened periodically to check for fin clips. Sockeye salmon collected in the compound will be examined for marks, sampled, and returned to salt water. All those returned to salt water will be marked with a hole-punch in the caudal fin to prevent sampling duplication. Sockeye salmon that ascend the fish pass more than twice (2 holes punched) will be retained. Marked fish observations will be recorded on the MARKED FISH REPORTING FORM (Figure 5) and labeled as adults.

Adult Sockeye Salmon ALS Sampling and Examination for Marks

Adult sockeye salmon will be sampled according to the procedures outlined in Appendices D.1-D.5). Sockeye salmon sampled for ALS data will be inspected for fin clips. If a sockeye salmon possessing fin clips is found, two scales will be collected from the marked fish. One scale will be placed on the original card (labeled: AWL XXXA) and the second scale placed on the corresponding number on a second card (labeled: AWL XXXB). When possible, additional adults should be examined for marks. Record the number of fish examined and any marks observed on the appropriate MARKED FISH REPORTING FORM (Figure 5) for the examination site. Clips to look for are Left Ventral, Right Ventral, Adipose-RV, and Adipose-LV. The scale cards for marked sockeye salmon will have a separate number system and be labeled as "select sample."

Sport Fishery and Subsistence Monitoring

The sport fishing effort in Kitoi Bay (statistical area 252-32) will be monitored throughout the field season. Charter vessels fishing in the area will be documented. The number of sport fishers in the area will be recorded and harvest by species estimated and recorded on the SPORT FISHERY MONITORING FORM (Figure 9). The sockeye salmon catch will be examined for fin clips and the results recorded on MARKED FISH REPORTING FORM (Figure 5). All marked fish from the sport catch will be sampled for ALS data. An estimate of subsistence effort and harvest will also be made when possible.

Chum Salmon Brood Stock Sampling

During the chum salmon egg take at Kitoi Bay Hatchery, brood fish will be sampled for ALS data on a weekly basis to achieve a sample size of 600 fish. Additionally, 600 chum salmon will be sampled for ALS data from the commercial catch in the Kitoi Bay Section.

PHYSICAL DATA

Weather

Physical data will be collected at the smolt sites and at Little Kitoi fish pass on a daily basis during sampling. Information will be recorded on the DAILY PHYSICAL OBSERVATION FORM (Figure 10) and will include: water and air temperatures, water height, and estimates of percent cloud cover, wind direction and velocity, and precipitation.

Limnology Sampling

Lake limnology sampling will be conducted at Little Kitoi (station $^{\#}1$), lower Jennifer, and Ruth Lakes as described in Koenings et al. 1987. Water samples from Little Kitoi Lake will be flown immediately to Kodiak for filtering. Care must be taken to assure that the Kodiak staff are notified that the samples have been sent so they are not left at the air charter office. Limnology sampling will take place at six-week intervals, mid May through late September.

OTHER REQUIREMENTS

Each employee will possess CPR/First Aid Certification as required by the department Standard Operating Procedures (SOP), prior to assignment to the Kitoi Project. In addition, each employee will review the pertinent sections of the ADF&G SOP. Specific guidelines to review include: Safety Policy/ Standards, Field Camp Safety, Aircraft Safety/ Passenger, Boating Safety, Laboratory Safety, Small Tool Handling, and Firearm/ Bear Safety.

There is additional information in the office safety files to supplement the SOP and is also available for review. The Fishery Technician III will watch survival videos at the bunkhouse in Kodiak before departing to the field.

Project biologists will be responsible for providing the necessary equipment and information to field technicians. **Each employee is responsible for reviewing the safety videos.**

Air Charters

All air charters will be set up through Kodiak staff. Appropriate information in regard to charters will be relayed through daily telephone contact. It is important to contact office personnel when any data, equipment or other freight will be "back hauled" to Kodiak. Packages or important data should be addressed to Steve Schrof or Steve Honnold and a phone number listed on the envelope (486-1872).

Reporting

The fishery technician will be responsible for reporting all job activities, compiling biological data, and assuring quality control. Pencil rather than a pen will be used for hardcopy data entry. Data forms and a field journal will be completed daily. "Rite in the rain" field log books will be used in the field to record data and the data transferred onto the forms at the hatchery. Completed data forms will be sent to project biologists in Kodiak weekly. Faxed data will be appropriately labeled for in-office delivery. Data physically sent to Kodiak should be copied, properly packaged, and labeled.

At the conclusion of the field season, the fishery technician will submit a report summarizing Kitoi Evaluation Project field activities to project biologists. Refer to KITOI ANNUAL FIELD REPORT 2001 for format. In addition, a report of project activities will be faxed to town weekly. A one page weekly report is sufficient (Appendix E). Include a section listing anticipated activities for the following week.

Inventory

Upon completion of the project, the fishery technician will complete a thorough inventory of all project equipment will be given to the project biologist at the end of the field season. The final location of each inventoried item will be noted (i.e. at Kitoi, warehouse bin, etc.).

Video/Photo Documentation

The fishery technician will be responsible for documenting project activities by video and/or photograph. Specific aspects such as trap installations, and other detailed tasks are important to document. When possible, ADF&G video/cameras and film will be used. If, however, ADF&G

equipment is not available, film will be provided for use with personal cameras. The use of personal cameras is suggested in this case, but not required.

Timesheets

All timesheets are to be in the Kodiak office by the 15th and the last day of each month. When the employee is working in the field and receives hazard pay, the timesheet "Comments" column is to have the location of the field camp. Work activities should be scheduled to be completed in a 7.5 hour day. There are times in the field (high water events, etc.) when personnel need to work beyond the normal work day to ensure project objectives are being met. However, an attempt should be made to contact the project biologist to discuss the need to work additional overtime.

LITERATURE CITED

Alaska Department of Fish and Game. 2000. Salmon Research Operational Plans for the Kodiak Area, 2000. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 4K00-40, Kodiak.

Koenings, J.P., J.A. Edmundson, G.B. Kyle, and J.M. Edmundson. 1987. Limnology field and laboratory manual: Methods for assessing aquatic production. Alaska Department of Fish and Game, FRED Division Report Series 71, Juneau.

McCullough, J.M., D. Aro and S.G. Honnold. 2000. Kitoi Bay Hatchery Annual Management Plan, 2000. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 4K00-43, Kodiak.

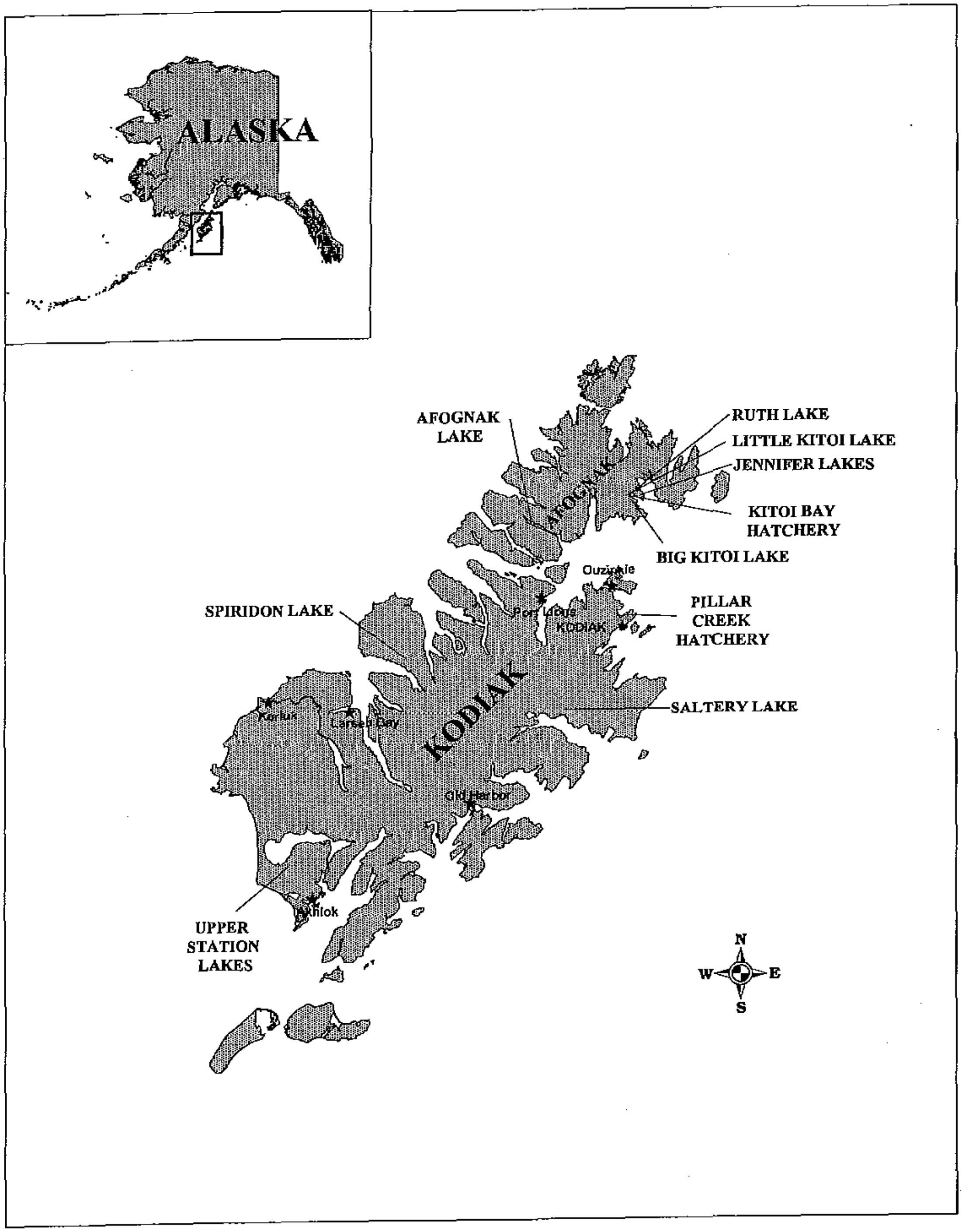


Figure 1. Location of brood stock collection and juvenile stocking sites for the sockeye salmon development program at Kitoi Bay Hatchery, Afognak Island.

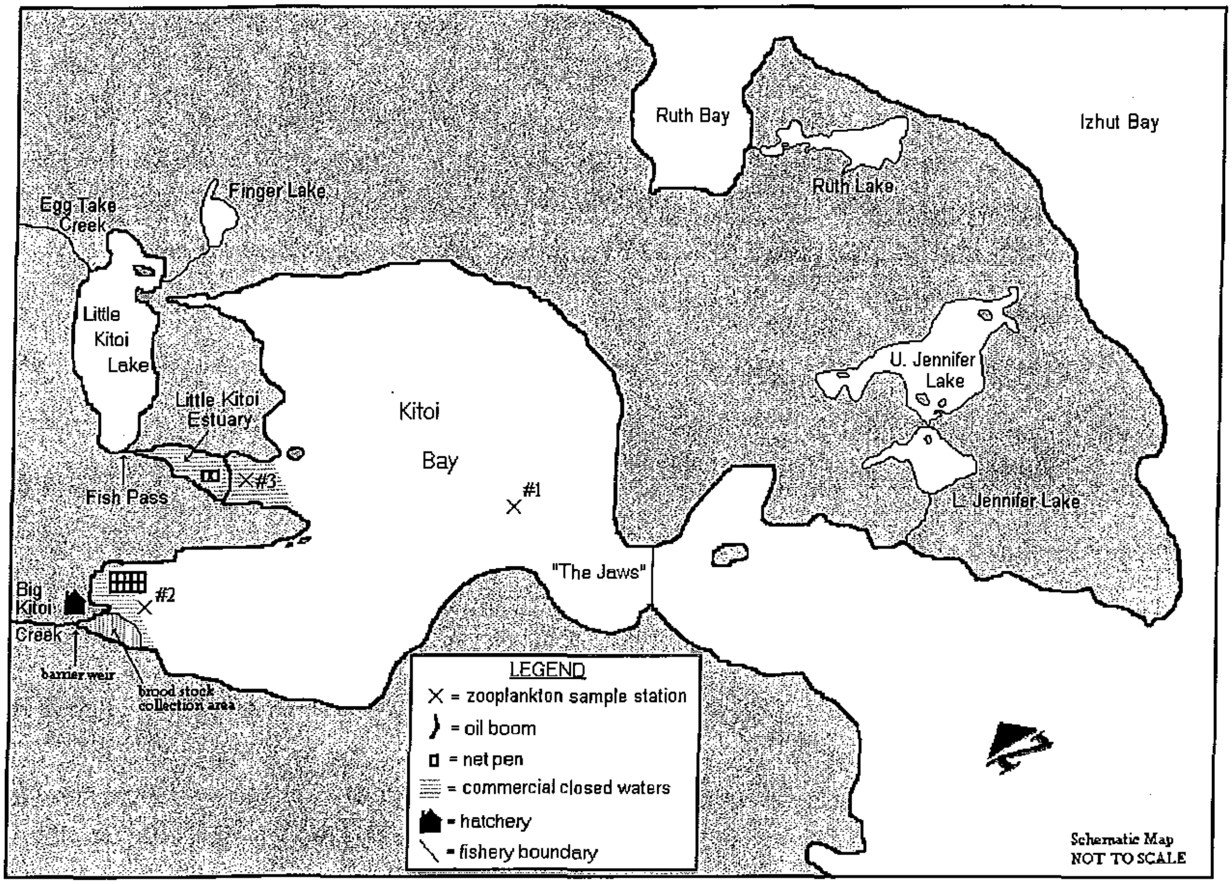


Figure 2. Location of the sampling sites evaluated under the Kitoi evaluation and monitoring project.

SOCKEYE SMOLT SUMMARY FORM

Little Kitoi Lake Year:

Date	Daily Counter Total	Total Fyke Catch	Sockeye Smolt: Smolt Catch	Percent of Catch[1]	Total Daily Estimate[2]	Cum Total Estimate	Mortality: Daily	Mortality: Cum	AWL Sample: Daily	AWL Sample: Cum	Comments

[1] Percent of Catch = Smolt Catch / Total Fyke Catch

[2] Total Daily Estimate = Percent of Catch x Daily Counter Total

soxform.xls

Figure 3. Sockeye Salmon Smolt Summary form.

Daily Smolt Trap Catch Reporting Form

Location:

Year:

Trap Used:

	Daily Catch									
	Sockeye		Coho		Pink	Dolly	Steel-	Stickle-	Total Trap	
Date	smolt	fry	smolt	fry	fry	Varden	head	backs	Catch	Comments:

fykeform.xls

Figure 4. Daily Smolt Trap Catch Reporting form.

Marked Fish Reporting Form

Species:
Location:

Smolt / Adult
Year:

Date	Number Species Caught*	Number Examined for Marks	Ad-RV				RV				Ad-LV				LV				Comments:
			observed		sampled		observed		sampled		observed		sampled		observed		sampled		
			daily	cum	daily	cum	daily	cum	daily	cum	daily	cum	daily	cum	daily	cum	daily	cum	
Totals:																			

* When used at the fish pass, indicate number returned to salt water.

markform.xls

Figure 5. Marked Fish Reporting form.

TEMPERATURE, SALINITY AND ZOOPLANKTON SAMPLING FORM

Location:

Sampling Station:

Date:

Time:

Weather:

Sampling Personnel:

Time:

Depth (M)	Temperature (C)	Salinity (ppt)	Comments:
surface			
0.5			
1.0			
1.5			
2.0			
2.5			
3.0			
3.5			
4.0			
4.5			
5.0			
6.0			
7.0			
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			
14.0			
15.0			
16.0			
17.0			
18.0			
19.0			
20.0			

ZOOPLANKTON:

No. of Tows:

Tow Depth:

Tow Angle:

Net Size:

Preservative:

Comments:

plankton.xls

Figure 6. Temperature, Salinity and Zooplankton Sampling form.

Fishery Monitoring Form

2002

Chum Egg Take or Sport Fish

KITOI BAY SECTION, 252-32

Date	# Vessels/ Persons Fishing	Estimated Total Daily Catch	Est. Daily Sockeye Catch	Cumulative Sockeye Catch	Daily # Sockeye Examined[1]	Cumulative Sockeye Examined	Daily # Jacks Examined[2]	Daily # Sockeye Sampled[3]	Cumulative # Sockeye Sampled	Comments:

[1] Number of sockeye examined may exceed the number sampled, and includes jacks examined.

[2] Number of sockeye jacks examined should include any sampled.

[3] Number of sockeye sampled should not exceed the number examined.

Note: All estimates of fish refer to numbers of fish, and not poundage.

monitor.xls

Figure 7. Egg Take / Sport Fishery Monitoring form.

DAILY PHYSICAL OBSERVATIONS
KITOI BAY
year:

Date	Time	Temperature				Gauge Depth (cm)	Precip (mm)	Weather
		Kitoi Hatchery		L.Kitoi Fishpass				
		min	max	air	water			

weather.xls

Figure 8. Daily Physical Observations form.

APPENDIX

Appendix A.1. Procedure for sampling salmon smolt for age-weight-length data.

AWL Forms

Smolt length and weight will be recorded on AWL forms (Appendix A.2). Using a no. 2 pencil, complete each section of the left side of the AWL and darken the corresponding blocks:

Description: Include species (sockeye smolt), location, year, and samplers.

Card: The AWL forms and corresponding slides are numbered sequentially by date throughout the season starting with #001. A new, consecutively numbered form is used each day even if the previous card is not completed. There may be a minimum of one fish and a maximum of 40 fish (8 slides) per AWL form.

Species: Refer to the reverse side of the AWL form to obtain species: **sockeye = 2.**

Day, Month, Year: Use the appropriate digits for the date fish are sampled.

	District	Subdistrict	Stream	
Little Kitoi	252	32	323	(smolt)
Big Kitoi	252	32	324	(smolt)

Period: List the period in which the fish were sampled (refer to Appendix A.3).

Project: Refer to the reverse side of the AWL form to obtain a code; **code 8** for smolt.

Gear: Refer to the reverse side of the AWL form to obtain a code; **00 = trap.**

Mesh: Leave blank.

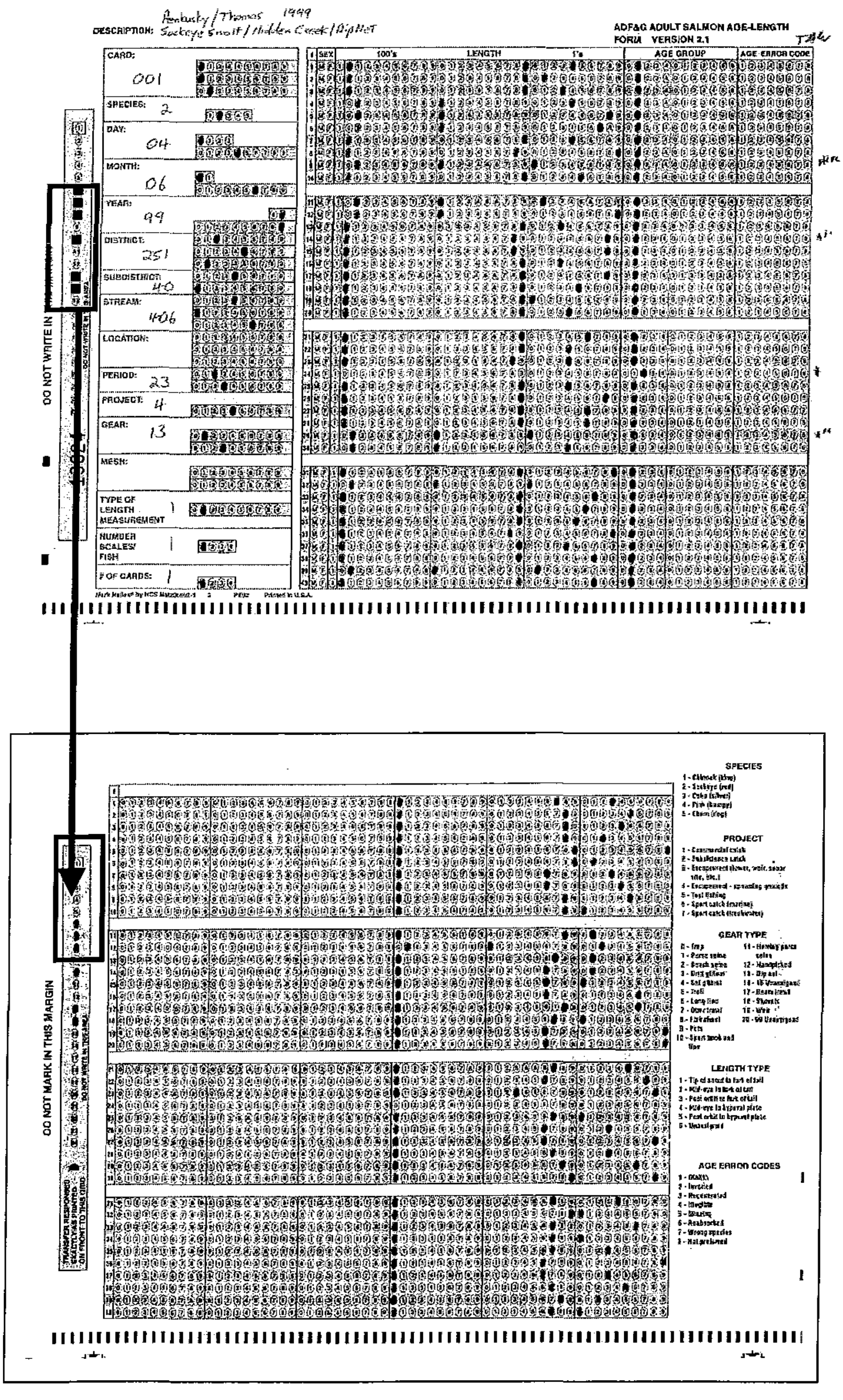
Type of Length Measurement: Refer to the reverse side of the AWL form to obtain a code; **Tip of snout to tail fork = 1** (Appendix A.4).

Number of Scales: Put a number **1** (refers to the column of scales per fish, which is one).

# of Cards: Put a number **1**. Keep litho codes in numerical order throughout the season and be sure to transfer the litho code from the front left side to the backside of the AWL form when sampling smolt. These forms will be optically scanned and stray marks may be misinterpreted.

The crew leader is responsible that all forms are carefully edited before returning them to your supervisor.

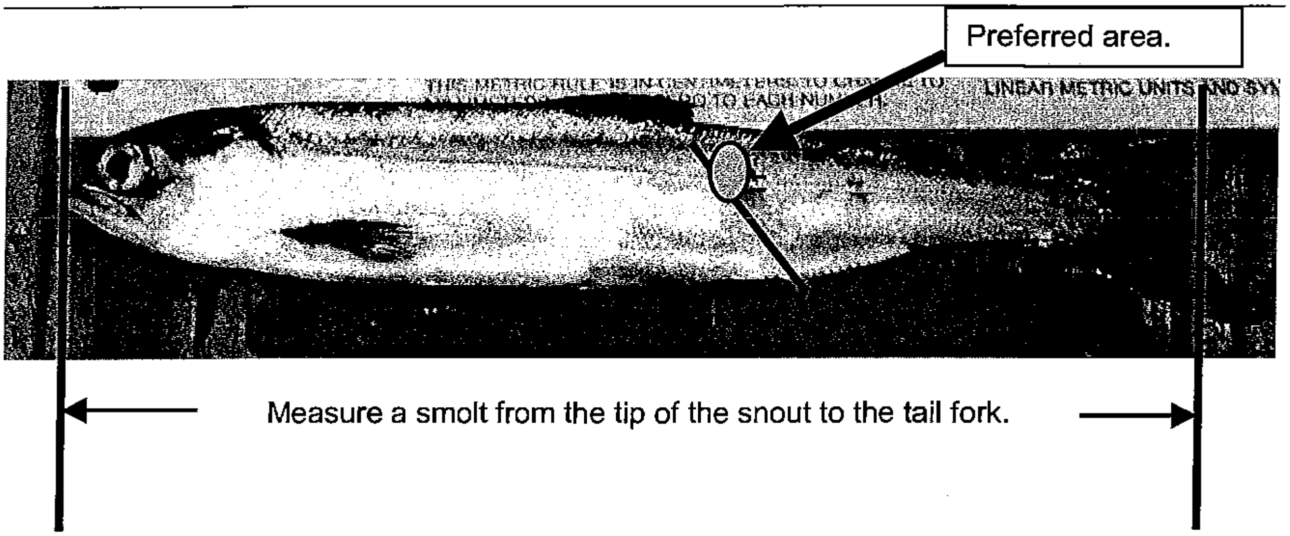
Appendix A.2. Example of a completed AWL form for smolt sampled.



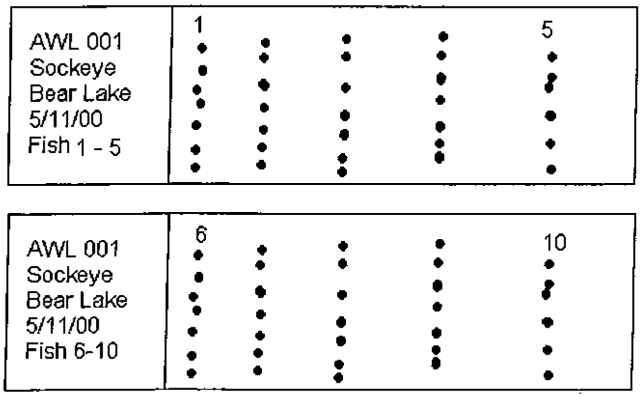
Appendix A.3. Period codes and corresponding dates for the period section on AWL forms.

Period	Dates	Period	Dates
1	01-Jan to 03-Jan	28	05-July to 11-July
2	04-Jan to 10-Jan	29	12-July to 18-July
3	11-Jan to 17-Jan	30	19-July to 25-July
4	18-Jan to 24-Jan	31	26-July to 01-Aug
5	25-Jan to 31-Jan	32	02-Aug to 08-Aug
6	01-Feb to 07-Feb	33	09-Aug to 15-Aug
7	08-Feb to 14-Feb	34	16-Aug to 22-Aug
8	15-Feb to 21-Feb	35	23-Aug to 29-Aug
9	22-Feb to 28-Feb	36	30-Aug to 05-Sep
10	01-Mar to 07-Mar	37	06-Sep to 12-Sep
11	08-Mar to 14-Mar	38	13-Sep to 19-Sep
12	15-Mar to 21-Mar	39	20-Sep to 26-Sep
13	22-Mar to 28-Mar	40	27-Sep to 03-Oct
14	29-Mar to 4-Apr	41	04-Oct to 10-Oct
15	05-Apr to 11-Apr	42	11-Oct to 17-Oct
16	12-Apr to 18-Apr	43	18-Oct to 24-Oct
17	19-Apr to 25-Apr	44	25-Oct to 31-Oct
18	26-Apr to 02-May	45	01-Nov to 07-Nov
19	03-May to 09-May	46	08-Nov to 14-Nov
20	10-May to 16-May	47	15-Nov to 21-Nov
21	17-May to 23-may	48	22-Nov to 28-Nov
22	24-May to 30-May	49	29-Nov to 05-Dec
23	31-May to 06 June	50	06-Dec to 12-Dec
24	07-June to 13-June	51	13-Dec to 19-Dec
25	14-June to 20-June	52	20-Dec to 26-Dec
26	21-June to 27-June	53	27-Dec to 31-Dec
27	28-June to 04-July		

Appendix A.4. Photo of a smolt with the preferred area highlighted.



Appendix A.5. An example of correctly labeled smolt AWL slides.



When the slides are completed, return them to the box in order by AWL # and fish #, and label the slide box on top with the following information:

Location: Little Kitoi Lake
AWL Number: AWL 001-003
Beginning and end dates: 6/12-7/13/00

Appendix B. Visual acquisition procedures.

---

1. **Open <VISUAL ACQUISITION> program.**
   -double click icon

2. **Open O-Scope window,**
   -drag & drop from right margin
   and turn on <AUTOMATIC TRACKING>.
   -right click in O-Scope window

3. **Enter temperature reading.**
   -Go to <VIEW>...<ENVIRONMENT>, or click on <ENV> button

4. **Configure data collection parameters.**
   -Go to <CHANNEL MENU>...<CONFIGURE>...<TRANSDUCER>
   -Check <SOUNDER INFORMATION> selected for <DUAL>
   -Set <START> and <STOP RANGE> (be sure STOP will exceed max bottom depth)
   -Enter a <THRESHOLD> (i.e. -70. dB)
   -Select <SQUARED>
   -Set <PULSE RATE> at 5 pps
   -Set <PULSE WIDTH> to 0.4 mS
   -Select <MONOTONE> for target collection
   DO <u>NOT</u> HIT <RUN> IF TRANSDUCER IS <u>OUT OF WATER</u>!!!

5. **Confirm <TVG> setting at 40 logR.**
   -Go to <DISPLAY SETTINGS>...<TVG>

6. **Open file name.**
   -Go to <FILE> menu...<SAVE AS>, or push <AS> button
   -Enter file name (as per standard convention)
   -Save file in appropriate folder

7. <u>PUT TRANSDUCER IN WATER</u>, **if not already.**

8. **Turn transducer on**
   -Go to <CHANNEL>...<RUN>
   and head toward transect start point (equivalent to "fin on").

9. **When ready to start transect begin logging to file** (equivalent to turning on DAT tape).
   -Go to <FILE>...<BEGIN LOGGING>

10. **Observe O-Scope window for targets and noise.**

11. **Watch bottom profile and end transect.**
    -Hit escape key, <ESC>, to end <RUN> and <STOP LOGGING>

12. **Turn away from shore, remove transducer from water, and head to next transect.**

13. **Repeat procedure from Step 6** (if program remains open).
    If program was exited repeat from Step 1.

Appendix C. Summary of visual analysis echo counting procedures.

---

1. Open file and set display settings
   -Select 40 for TVG
   -Narrow tranducer beam

2. Step 1 Analysis.
   -Set up Bottom Tracking
   -Set up Echo Recognition
   -Set Reports/ Strata
   -Set to Single Beam

3. Go to produce <*.csv> file and save.

4. Clip parts out of CSV file to Excel Worksheet, <ekocount.xls>.
   -Total Ping Count
   -Echo Pulse Rate (pps)
   -Strata Depths
   -Echo Counts per Stratum (Targets Found)
   -Calculated Average Percent per Stratum

5. Duration In Beam
   -Zoom to stratum's vertical height and work across stratum
   -Measure number of Echoes per Fish
   -Insert measurements into Excel Worksheet, <ekocount.xls>
   -Repeat measurements for each stratum

6. Input Surface Area and other queried data in Excel Worksheet, <ekocount.xls>

Appendix D.1. Procedure for sampling salmon adults for age-sex-length data.

AWL Forms

Adult sex and length will be recorded on AWL forms (Appendix D.2). Using a no. 2 pencil, complete each section of the left side of the AWL and darken the corresponding blocks:

Description: Include species (adult sockeye), location, year, method of capture (purse seine, weir) and samplers.

Card: The AWL forms and gum cards are numbered sequentially by date throughout the season starting with #001. A new, consecutively numbered form is used each day even if the previous card is not completed. There may be a minimum of one fish and a maximum of 40 fish per AWL form.

Species: Refer to the reverse side of the AWL form to obtain species: **sockeye = 2**.

Day, Month, Year: Use the appropriate digits for the date fish are sampled.

	District	Subdistrict	Stream	
Little Kitoi	252	32	323	(adult fish pass)
Big Kitoi	252	32	324	(brood stock)
Kitoi Bay Section	252	32		(adult commercial catch)

Period: List the period in which the fish were sampled (refer to Appendix A.3).

Project: Refer to the reverse side of the AWL form to obtain a code **(commercial catch = 1 or escapement = 3).**

Gear: Refer to the reverse side of the AWL form to obtain a code; **01 = purse seine or 19 = weir.**

Mesh: Leave blank.

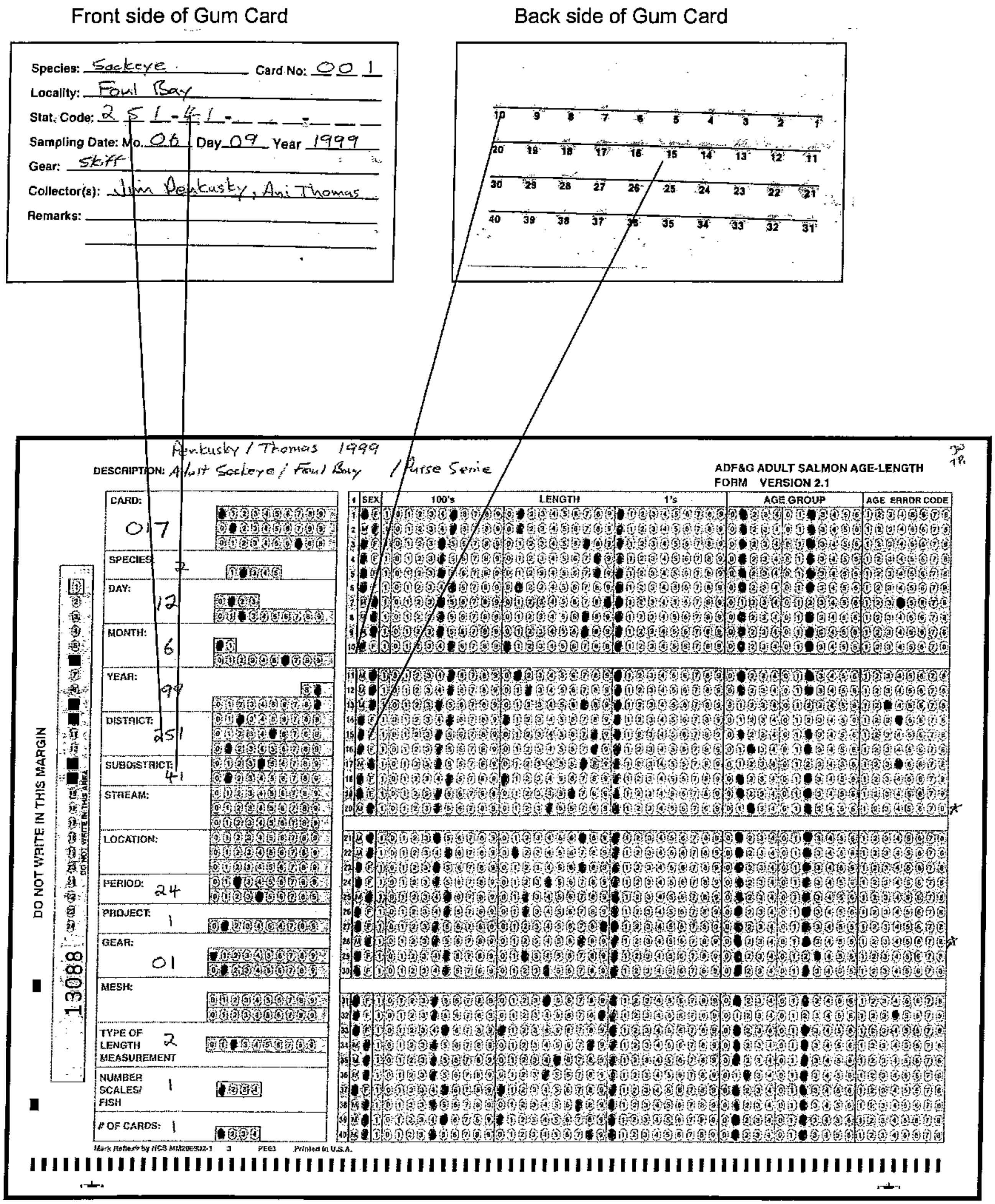
Type of Length Measurement: Refer to the reverse side of the AWL form to obtain a code **(2 = mid-eye to fork of tail).** Measure the fish from mid-eye to the tail fork (Appendix D.3).

Number of Scales: Put a number **1** (refers to the column of scales per fish, which is one).

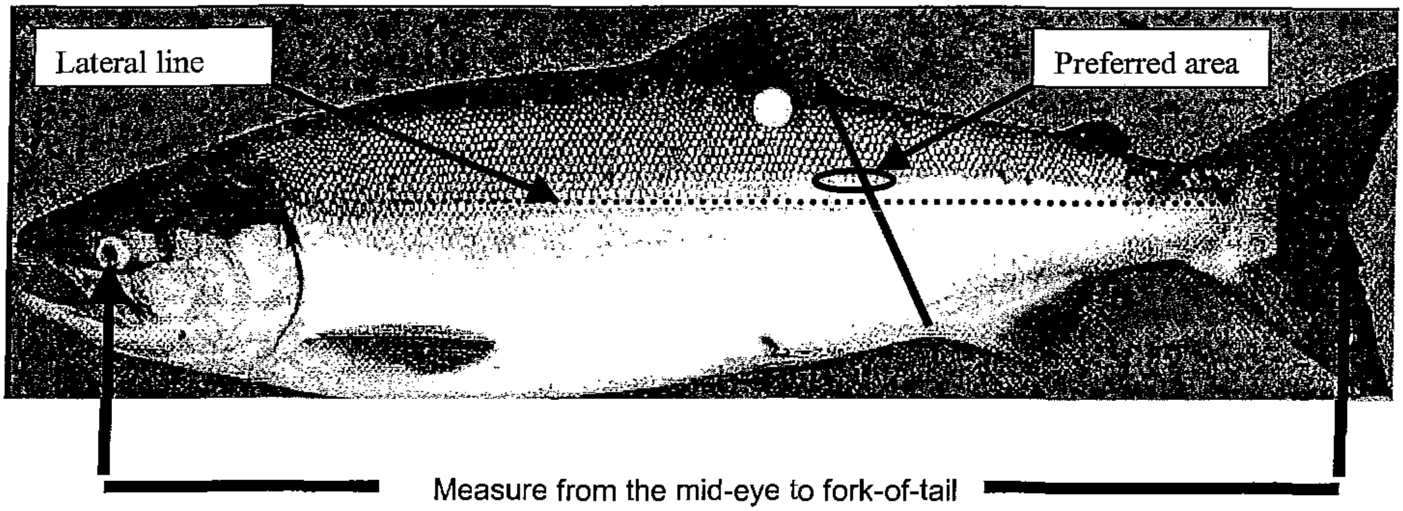
# of Cards: Put a number **1**. Keep litho codes in numerical order throughout the season. These forms will be optically scanned and stray marks may be misinterpreted.

The crew leader is responsible to make sure that all forms are carefully edited before returning them to your supervisor.

Appendix D.2. Example of an AWL form and gum card completed for adult salmon.



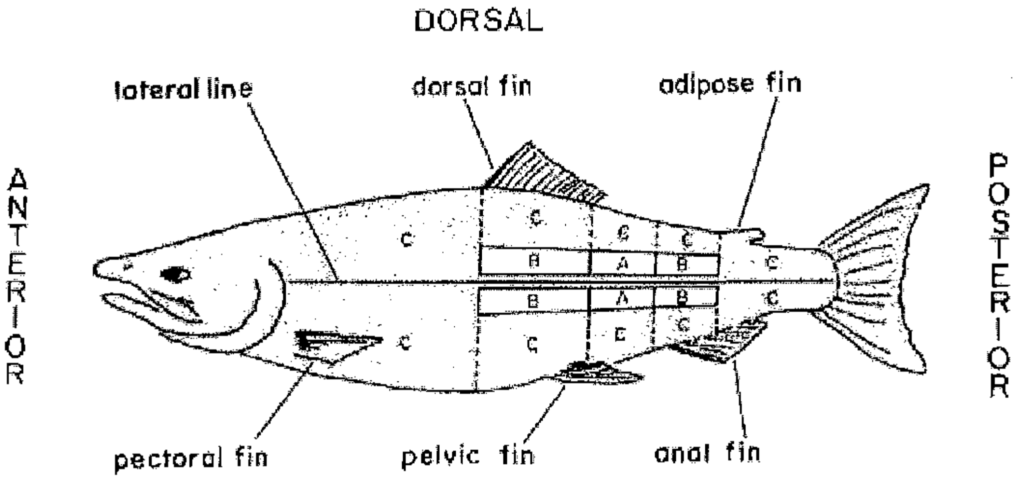
Appendix D.3. Measuring fish length mid-eye to fork-of-tail.



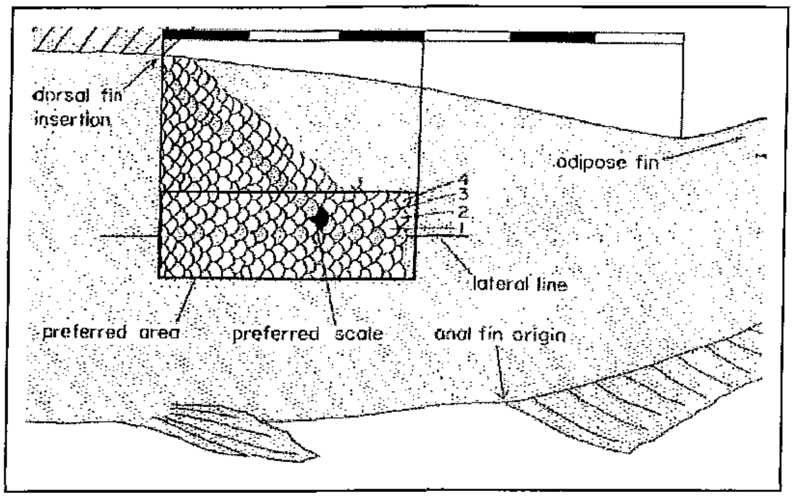
Mid-eye to fork-of-tail lengths are taken because the shape of the salmon's snout changes as it approaches sexual maturity. The procedure for measuring by this method is as follows.

1) Place the salmon flat on its right side on the measuring board with its head to your left and the dorsal fin away from you.
2) Slide the fish in place so that the middle of the eye is in line with the edge of the meter stick and hold the head in place with your left hand.
3) Flatten and spread the tail against the board with your right hand.
4) Read and record the mid-eye to fork length to the nearest millimeter.

Appendix D.4. Removal and mounting of the preferred scale.

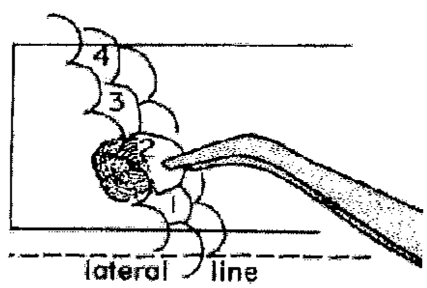


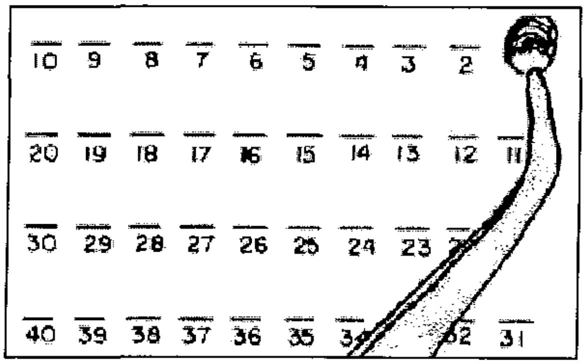
INPFC rated areas for scale removal. Area A is the preferred area. Area B is the second choice if there are no scales in area A. Area C designates non-preferred areas. If scales on the left side are missing, try the right side.



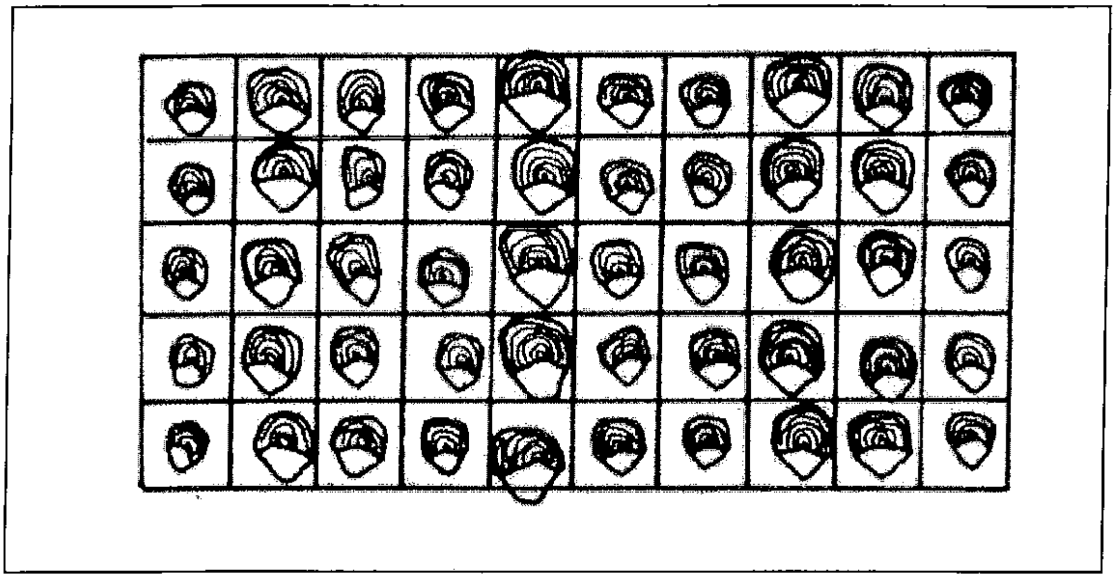
The preferred scale in this diagram is solid black. It is located 2 rows up from the lateral line, on a diagonal from the insertion (posterior) of the dorsal fin "back" toward the origin of the anal fin.

Do not turn scale over.

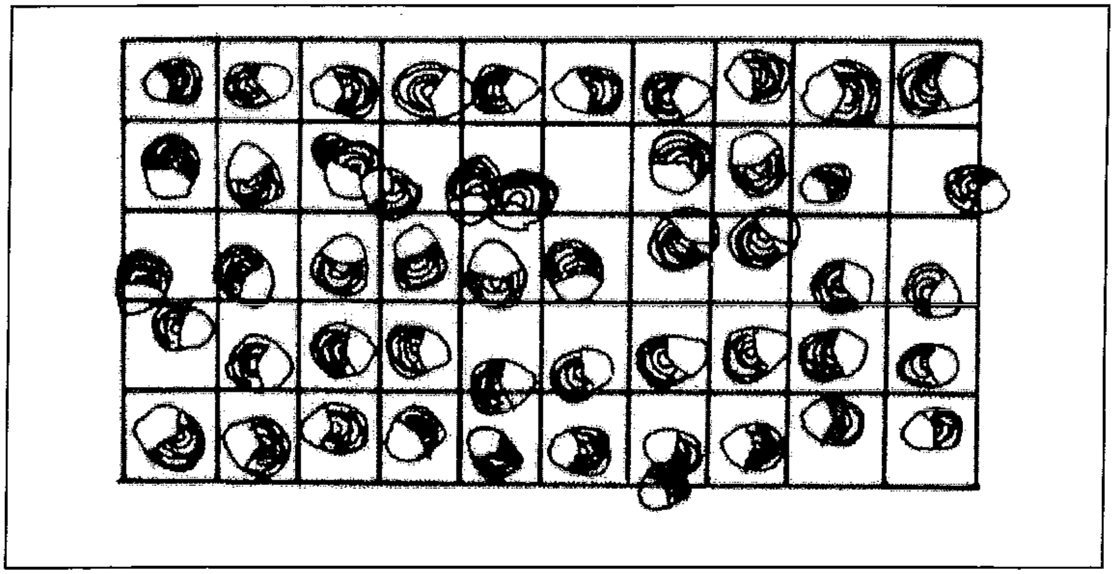




Appendix D.5. Scale orientation on the gummed card.



The scales are all correctly oriented on the card in the same direction, with the anterior portion of the scale pointed toward the top of the card.



The scales are incorrectly oriented in different directions. This increases the time spent to age samples.

Appendix E. Example of a weekly report format.

To: Steve Honnold
ADF&G, Area Development Biologist
Kodiak, Alaska

Date: August 1, 1996

From: Millie Gray
ADF&G, FT-III
Kitoi Hatchery

Subject: Weekly Report

Little Kitoi Smolt Enumeration & Sampling

Pulled the fyke net trap today (8-1-96) ending the count for July 31, 1996. For the last five days there have been only sticklebacks passing through the counter. As to date this brings our estimated sockeye total to 88,925. The total sampled have been 1,116 (AWL 001 to 044). Total clips found were 515 of which 201 were right ventral, 313 were adipose/ right ventral and 1 was left ventral clip.

Little Kitoi Adult Enumeration & Sampling

Adult numbers have continued to slow down through out the week with the jack ratio remaining about the same. The overall percent of jacks is at 52%. Thus far I have found 70 marked fish. Most have been jacks, with 69 being RV and 1 LV. Lots of pinks milling around in Little Kitoi Bay with very few sockeye seen today.

Hatchery

7-30-96 Completed Chum salmon egg take with a total of approximately 30 million eggs being collected. I sampled a total of 800 fish through out the egg take.
7-30-96 The new aluminum boat was moved up into Little Kitoi Lake.

Commercial Fisheries

7-29-96 Fisheries opened in Kitoi Bay at noon and closed at 6 p.m. There was 1 tender and 2 boats fishing. A total of approximately 55,000 lbs of fish were harvested. Of those approximately 250 lbs were sockeye salmon and 50 lbs were coho salmon. I was able to collect 7 lengths and scales off sockeye.

Miscellaneous

7-31-96 Did a survey of Little Kitoi Lake to try and locate any of the sockeye. I saw 1 small jack by the outlet of the creek behind the island. I also started a survey of the middle basin (station #3) to determine at what depth the hydrogen sulfide chemocline exists.

Anticipated Activities

Monitor smolt counter at Little Kitoi.
Monitor and enumerate adult weir at Little Kitoi.
Sample adult sockeye at Little Kitoi.
Monitor the commercial fishery when opened in Kitoi Bay.
Continue with mapping of hydrogen sulfide in Little Kitoi Lake.

SPIRIDON LAKE SOCKEYE SALMON SMOLT AND COMMERCIAL FISHERY MONITORING PROJECT, OPERATIONAL PLAN, 2002

ALASKA DEPARTMENT OF FISH AND GAME

By
Steven G. Honnold

Alaska Department of Fish and Game
Division of Commercial Fisheries
211 Mission Road
Kodiak, AK 99615

April 2002

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INTRODUCTION

Spiridon Lake is located on the west side of Kodiak Island (approximately 74 km southwest of the city of Kodiak) within the Kodiak National Wildlife Refuge (KNWR; Figure 1). It is the third largest lake on Kodiak Island and drains into Telrod Cove and Spiridon Bay by way of Telrod Creek. Spiridon Lake does not have anadromous salmon runs due to a series of impassable falls on Telrod Creek.

The Alaska Department of Fish and Game (ADF&G) and the Kodiak Regional Aquaculture Association (KRAA) stocked Spiridon Lake with juvenile sockeye salmon *Oncorhynchus nerka* from 1990 through 2001 (Honnold 1997; Honnold and Schrof 2001). A pipeline was installed on the outlet of Spiridon Lake in 1991 to allow annual smolt emigrations to bypass a series of barrier falls.

Annual sockeye salmon smolt emigrations from Spiridon Lake are enumerated and sampled for age and size to assess growth and fry-to-smolt survival. These efforts include operation and maintenance of a bypass system (diversion weir, traps, dewatering tanks, and pipeline) in May and June.

Returning adult sockeye salmon are harvested in the Northwest Kodiak District with a large portion caught in the Spiridon Lake Terminal Harvest Area (SLTHA). The 2002 sockeye salmon run is forecast to range from 144,000 to 299,000 adults (Eggers 2002). In addition to operating the bypass system, the fishery within the SLTHA will be monitored. Monitoring duties include estimating the build up of returning sockeye salmon, estimating and sampling of the sockeye salmon harvest, and estimating the incidental harvest of chinook *O. tshawytscha*, chum *O. keta*, pink *O. gorbuscha*, and coho *O. kisutch* salmon.

Goals

1. Evaluate the growth and survival of juvenile sockeye salmon stocked into Spiridon Lake.

2. Ensure that smolt survive when emigrating to the marine environment from Spiridon Lake.

3. Monitor the commercial fishery and evaluate the magnitude and biological attributes of the adult run to the SLTHA.

4. Comply with the monitoring requirements of the Spiridon Lake Management Plan in agreement with the Kodiak National Wildlife Refuge.

Objectives

1. Prevent emigrating smolt from passing over the series of barrier falls to minimize injury and/or mortality.

2. Estimate the number and timing of sockeye salmon smolt emigrating from Spiridon Lake.

3. Estimate the average size-at-age of the sockeye salmon smolt emigration.

4. Estimate the daily commercial salmon harvest in the SLTHA (at Telrod Cove) by species.

5. Estimate the SLTHA (Telrod Cove) and Telrod Creek pink and sockeye salmon runs.

6. Estimate the age composition of the SLTHA (Telrod Cove) adult sockeye salmon run.

Primary Tasks

1. Install, operate, and maintain a smolt trapping and pipeline system throughout the sockeye salmon smolt emigration.

2. Estimate the daily emigration of sockeye salmon smolt by time counts.

3. Sample 70 sockeye salmon smolt per day, five days per week, for scales, weight, and length data.

4. Collect physical data daily.

5. Conduct weekly foot surveys to estimate adult salmon in lower Telrod Cove Creek from late June through the end of the sockeye salmon fishery.

6. Estimate and report the SLTHA salmon build up, vessel activity, and estimate salmon harvest by day and by species throughout the fishery.

7. Sample 240 adult sockeye salmon/week (about 1,600 total) for age, sex, and length from the commercial fishery at SLTHA (Telrod Cove).

SUPERVISION

Project Biologists: Steve Honnold (primary) - Fishery Biologist III (FB III)
Greg Watchers (secondary) - Fishery Biologist I (FB I)

Smolt Crew Leader: Greg Watchers - FB I

Smolt Crew: Ray Sheratine - Fish and Wildlife Technician II

SLTHA Fishery Crew Leader: Shelly Lawson - Fish and Wildlife Technician II

SLTHA Fishery Crew: Star Ames - Fish and Wildlife Technician I

The crew leaders will schedule daily tasks and oversee field operations and safety.

PROCEDURES

Trap Installation

1. Install two Canadian fan traps in Telrod Creek (mid channel) as indicated by permanent bank markers (Figure 2A,B).
2. Anchor the traps with cable to turnbuckles permanently attached to previously anchored duckbills on the stream bank.
3. Use 3 to 3.2 meter (10 - 12 foot) sections of 5.1 centimeter (two-inch) diameter pipe joined by NU-RAIL fittings as a frame to secure and support the traps (Figure 2A,B).
4. Use come-a-longs, secured to the overhead steel pipe cross members, to elevate the downstream ends of the traps (Figure 2C).
5. Secure additional cable supports from the traps to the overhead pipes.

Attachment of De-watering Tanks

1. Place de-watering tanks downstream of each trap and secure the tanks by cable to previously positioned duckbill anchors on the stream banks (Figure 3A,B).
2. Connect each trap to the de-watering tanks with sections of aluminum trough; secure the upstream ends of the troughs with threaded rod inserted through previously drilled holes (Figures 2C and 3A).
3. Use rubber and foam pipe insulation material to assure a tight fit between the ends of troughs and the tanks and traps.

Diversion Weir Installation

1. Construct a diversion weir upstream of the traps using a frame made from 1.6 meter (5 foot; (legs), and 2.8 meter (8 foot; cross members), 5.1 centimeter (two-inch) diameter pipe and NU-RAIL fittings (Figure 3C).
2. Attach 1.3 by 2.5 meter (4 by 8 feet) sheets of aluminum perforated plate to the frame starting at the traps and working upstream (Figure 3C).
3. Secure the first sheet of perforated plate on each side of the weir to each trap and screw it in place with the base resting on the streambed; continue placing sheets of perforated plate on the frame with each upstream piece overlapping the previous downstream piece by approximately six inches.
4. Install a "dam" where the weir meets the stream banks to make the weir "fish tight" near shore; use boards, sandbags and Lortex (plastic sheeting) for the dam.

5. Place a 1.5 meter (~2 feet) wide piece of Lortex along the entire base of each side of the weir to further seal the weir: place half of the width of sheeting on the substrate and half of the width on the base of the weir (Figure 4A). Place sandbags along the base of the weir to hold the sheeting in place.
6. Also use Lortex at the seams of the perforated plate and any other areas with protruding edges that may be hazardous to smolt.
7. Install a "V" type center de-water plate between the traps to direct additional flow toward the traps, which eliminates any "pooling" effect in front of the traps and reduces smolt pinning (Figure 3C).
8. Once the V is installed and screwed to the traps, line the inside of each trap with a blue tarp and/or lortex as needed.

Connecting the Pipeline

1. Attach a pipeline section to each of the downstream ends of the de-watering tanks (Figure 4B).
2. Make sure the open-ended pipeline sections at the counting tank are resting on the tank lip (Figure 4C).
3. Use a standpipe to adjust the water level in the counting tank and use a come-a-long to adjust the flow into the traps and de-watering tanks.

Bypass System Monitoring

1. Operate the traps to maintain efficiency and minimize smolt mortality, which requires frequent monitoring and maintenance since significant mortality can occur in a short period of time. Fish tend to hold in the tanks and pipeline during the day and any loss of flow through the system may result in mortality. Some mortality occurs due to the high water pressure and smolt being pinned on perforated plate.
2. Include an accurate account of mortality in the daily outmigration estimate.
3. Remove dead smolt from the system and dispose of them in a manner to avoid animal attraction.

Smolt Emigration Estimates (Timed Counts)

Daily estimates of the sockeye salmon smolt emigration from Spiridon Lake are made at the counting tank (most downstream tank) using time counts every half-hour (30 minutes) from about 2300 hours through 0500 hours. A 24-hour period from noon to noon, identified by the calendar date corresponding to the first noon, is used as a single enumeration day (smolt migrate primarily at night). Half-hour counts are from 1.5 minutes (minimum) to 8.0 minutes (maximum) in duration, depending upon the rate of smolt movement; the minimum time is used during large migrations and the maximum time during slower smolt movements.

1. At the beginning of a count, move the entrance pipes to allow smolt to drop into a catch basket submerged in the tank; use a stop-watch to time the collection of smolt in the catch basket.
2. After the count is over, record the count time and enumerate the smolt from the catch basket and release them down the pipeline or into the counting tank.
3. Use the same procedures if large smolt movements occur during the day (0500 to 2300 hours).
4. If smolt movement is slow enough, there may not be a need to make timed counts; hand count all the smolt in this case (if appropriate).
5. Move and secure the entrance pipes over the catch basket in the morning after each counting shift ends (~0500 hours); cover the catch basket to prevent smolt from jumping out.
6. Check the catch basket at 0700 hours; enumerate and release smolt collected. Repeat this step just prior to noon when the counting day ends.

Smolt Enumeration Data Management

1. Estimate the daily smolt emigration by calculating timed count estimates for each half-hour (30 minutes) counting period as follows: Multiply [**the number of smolt counted per time period** e.g. 1.5 to 8 minutes] by [**30 minutes divided by the time period** e.g. 30/1.5 to 8].
2. Record timed or hand counts (include "hand count" in "Remarks" section), migration estimates, and remarks on the *Spiridon Smolt Daily Reporting Form, 2002* (Figure 5).
3. Summarize daily trapping data on the *Spiridon Sockeye Salmon Smolt Summary Reporting Form, 2002* (Figure 6).

Age, Weight and Length Sampling

Seventy (70) sockeye salmon smolt from the daily emigrations are sampled each day, five days per week, for age, weight, and length (AWL) data. Smolts are collected while they are counted as described in the previous section of this operation plan; they are selected randomly from each half hour timed count and placed into a separate "sampling container" submerged in the counting tank. AWL data are typically collected from the smolts after the last count of the enumeration day. Note: the 24-hour enumeration day is equivalent to the sampling day. Prior to field deployment, proper AWL sampling methods are demonstrated to each crewmember and the project biologist(s) and or crew leader also demonstrates methods in the field to inexperienced technicians. General procedures are as follows:

1. Prepare all equipment prior to sampling, including: a small dipnet, two buckets with aerators, a basin for anesthetizing the smolt, thermometer, Tricaine Methanesulfonate (MS-222), baking soda, latex gloves, slide holder, labeled slides, scalpel, dissecting probe, measuring tape, and a rite-in-the-rain logbook.
2. Anesthetize the smolt with MS-222 as instructed by the Project Biologist (s); wear latex gloves to prevent direct exposure to MS-222.

3. Measure each smolt from the tip of the snout to the fork of the tail to the nearest millimeter and record in the rite-in-the-rain logbook (Appendix A.1).
4. Use a knife or scalpel to remove 5-10 scales from the preferred area (Appendix A.1).
5. Mount the scales on a glass slide with five fish per slide (Appendix A.2).
6. Label the left portion of each slide with the AWL number, location, species, date, and fish number (Appendix A.2).
7. Remove excess water from the smolts using a moist paper towel as a blotter and then record individual smolt weights in the rite-in-the-rain logbook to the nearest 0.1 gram.

AWL Data Management

1. Transcribe the AWL data to the mark-sense forms (Appendix A.3-A.5).
2. Record only 40 samples per mark-sense form (Appendix A.3-A.5).
3. Record names of personnel collecting the data at the top of each mark-sense form (Appendix A.3-A.5).

Physical Data

Water and air temperatures, stream height, percent cloud cover, wind direction and velocity, and precipitation data are collected at the smolt site at approximately 1100 and 2300 hours each day.

1. Use a standard thermometer to record temperature (°C).
2. Install a stream gauge (meter stick) upstream of the smolt diversion weir once the trap/bypass system is operational (preferably prior to the smolt emigration).
3. Measure stream height at the stream gauge.
4. Estimate percent cloud cover, wind direction, and wind velocity by direct observation.
5. Use a rain gauge to measure precipitation.
6. Record information on the *Daily Physical Observation Form, 2002* (Figure 7).

Stream Surveys

Foot surveys are conducted in lower Telrod Creek (to first barrier falls) once a week beginning 20 June and continue throughout the entire fishery monitoring period.

1. Enumerate the number of live and dead adult salmon by species.
2. Enumerate jack sockeye salmon separately from the overall sockeye salmon observed.
3. Document the abundance of pink salmon in the lower river and estuary.

4. Record survey data on the *Telrod Creek Escapement Surveys Reporting Form, 2002* (Figure 8).

Fishery Monitoring

The commercial salmon fishery in the SLTHA (Telrod Cove; Figure 1) is monitored from just prior to the initial opening until the final closure (about 20 June - 25 August).

1. Conduct daily surveys by skiff in Telrod Cove and Spiridon Bay to assess sockeye salmon run strength.
2. Relay fish estimates, based on size of aggregations and "jumpers," to the commercial fishery managers at 0800 and 2000 hour SSB radio schedules (3.230 MHZ).
3. Announce fishery openings under direction of commercial fishery managers when necessary.
4. Interview vessel skippers and tender operators to estimate daily catch by species.
5. Log vessel names, fishing locations, and estimated catch by species during each day's fishery on the *Spiridon Lake Terminal Harvest Area (Telrod Creek) Fishery Monitoring Reporting Form, 2002* (Figure 9).

Harvest Sampling

A portion of the commercial sockeye salmon catch from the SLTHA is sampled for age, sex, and size data. The minimum sampling goal for the season is 1,600 fish or about 240 fish weekly. An additional 300 sockeye salmon are sampled from catches near Hook Point (Figure 1). These fish are sampled as time and weather permits. Typically, three 100 fish samples are collected, spread out evenly throughout the fishery. Project biologists provide training to field technicians prior to the field season in general sampling methods following the "Kodiak Management Area Salmon Escapement Sampling Operational Plan, 2002" (ADF&G *in press*). Specific sampling techniques are demonstrated in the field by the project biologist or crew leader.

Safety

Each employee is responsible for receiving his/her own safety training and for performing duties in the field in a safe manner (e.g. wearing a PFD whenever riding in or operating a skiff or vessel). Crew leaders are responsible for ensuring that all the necessary safety equipment and resource materials are available to field technicians. All employees are required to:

1. Attend and pass a certified CPR/First Aid training course prior to field deployment.
2. Review the ADF&G Safety SOP manual prior to field deployment. Focus on the following sections of the manual: Policy/Standards, Building Safety, Field Camp Safety, Aircraft/Passenger Safety, Emergency/Survival Equipment Required in Aircraft, Boating Safety, Vehicle Safety, Laboratory Safety, Small Tool Handling, Firearm/Bear Safety and other

appropriate sections. After reviewing the manual, sign the Employee Safety SOP Verification form.

Radio Schedule and Air Charters

Communication between personnel in the field and project biologists stationed at the Kodiak ADF&G office is facilitated by single side band (SSB) radio at frequency 3.230 MHZ. During the smolt season, daily contact is from 1300 to 1315 hours Monday through Friday and at 1600 hours on Saturday and Sunday. Once smolt work ends and field personnel are working daytime hours, the radio schedule is from 0800 and 0830 hours each day and at 1600 hours on Saturday and Sunday.

Field personnel can contact the Kodiak ADF&G office from 0800 to 1630 hours if needed; however, contact during the specified times is not optional. **BE AWARE OF EMERGENCY CONTACT PROCEDURE POSTED ON EACH RADIO AND AT WHICH LONGITUDE AND LATITUDE COORDINATES YOUR CAMP IS LOCATED.**

Be prepared during daily radio contact to provide project biologists with the following information:

1. General weather conditions e.g. "1,000 foot broken ceiling, visibility 5 miles, winds are calm, and its raining"
2. Smolt Data
   - Daily and cumulative smolt counts
   - Daily and cumulative average smolt weight and length
   - Stream depth and water temperature
   - Other pertinent information regarding the bypass system, smolt movements, etc.
3. Fishery Monitoring Data
   - Daily and cumulative catch per species using the standard code (is defined inseason)
   - Daily and cumulative number of samples collected
   - Other information as requested
4. Logistics
   - Grocery and supply needs and approximate delivery dates (evening or weekend radio contact)
   - Expected time of arrival of returning air charters and what is on board

Reporting

Reporting is a critical component of the Spiridon Lake project. Project Biologists are ultimately responsible for the data collected; however, the managing and reporting of the data in an organized, understandable manner by crew leaders and crewmembers is essential to the success of the project. Crew leaders are responsible for reporting:

1. Daily work activities and biological data collected
   - Complete data forms and a field log daily using a no. 2 pencil.
   - Use "rite in the rain" field log books when collecting data in inclimate weather; transfer data on to data forms in sheltered area (weather port or cabin).
2. Weekly work activities and biological data collected
   - Write a one page weekly report of project activities following the format of Appendix B.
3. Season summary (Project Biologist will author and crew leader will assist)
   - Write a report summarizing Spiridon Project activities for the season.
   - Follow the format of Appendix C when writing this document.
   - Include specific information on hardware installation and removal, and system operation.
   - Include photographs of important and significant portions of the project (State cameras and film are available for project documentation).

Note: Send properly packaged and labeled data forms and required reporting to Kodiak on each available charter flight.

Equipment Storage and Inventory

Confer with the project biologist(s) for the protocol to follow regarding equipment tracking, and storage. Upon completion of the project, complete a thorough inventory of all project equipment and provide a list of what items will be needed for the 2003 season. Note the final location of each inventoried item (i.e. at Spiridon, warehouse bin, etc.) and attach the final list as an appendix to the project summary report.

Timesheets

Forward timesheets to THE KODIAK OFFICE BY THE 15TH AND LAST DAY OF EACH MONTH! Plan ahead to assure that timesheets arrive in town on time. A copy of the "Field Payroll Manual 2002" will be made available to field personnel, which describes the proper way to complete timesheets and leave slips. Plan work activities to be completed in a 7.5 hour day; work overtime only if pre-authorized by the Project Biologist.

LITERATURE CITED

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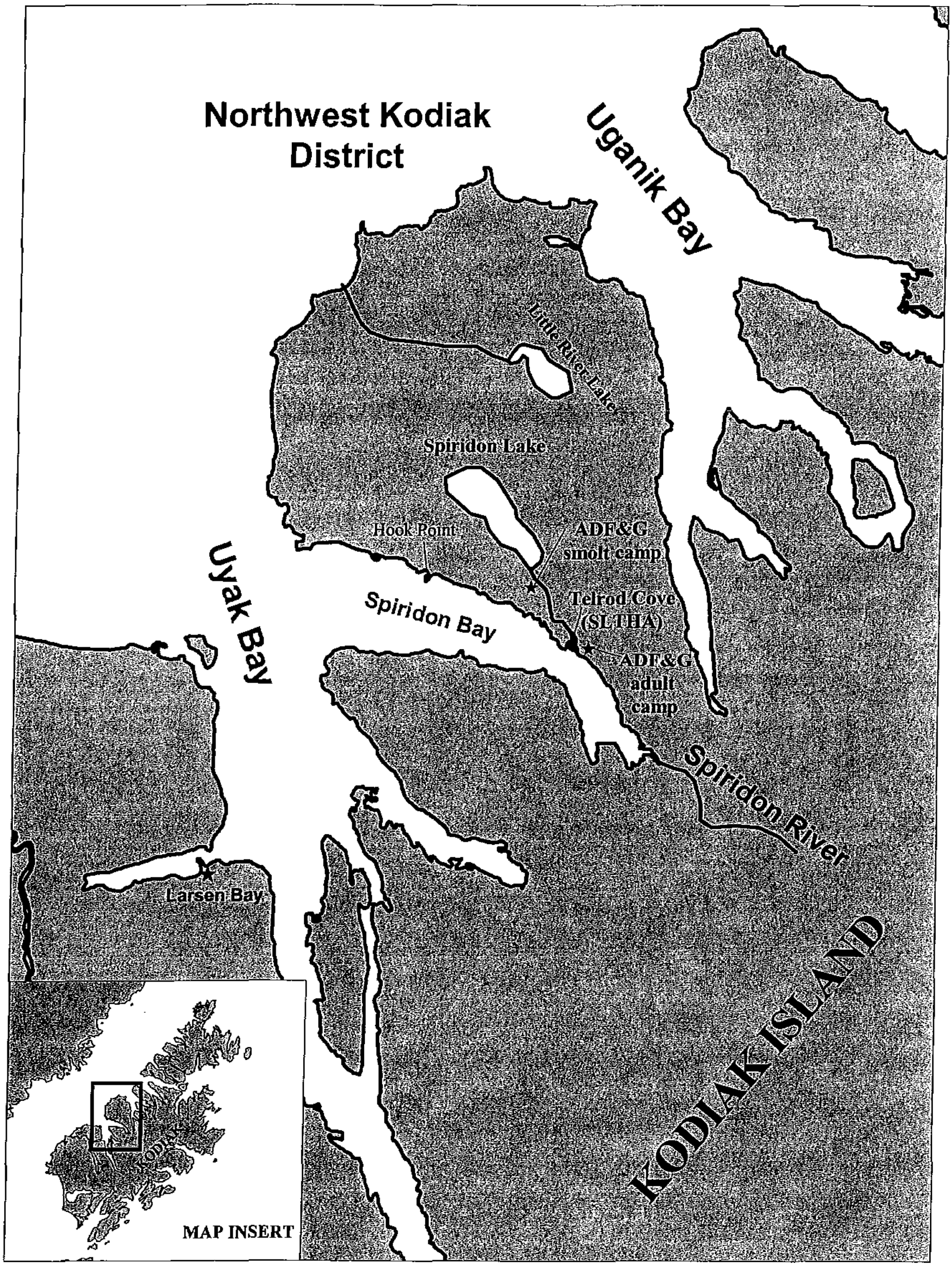
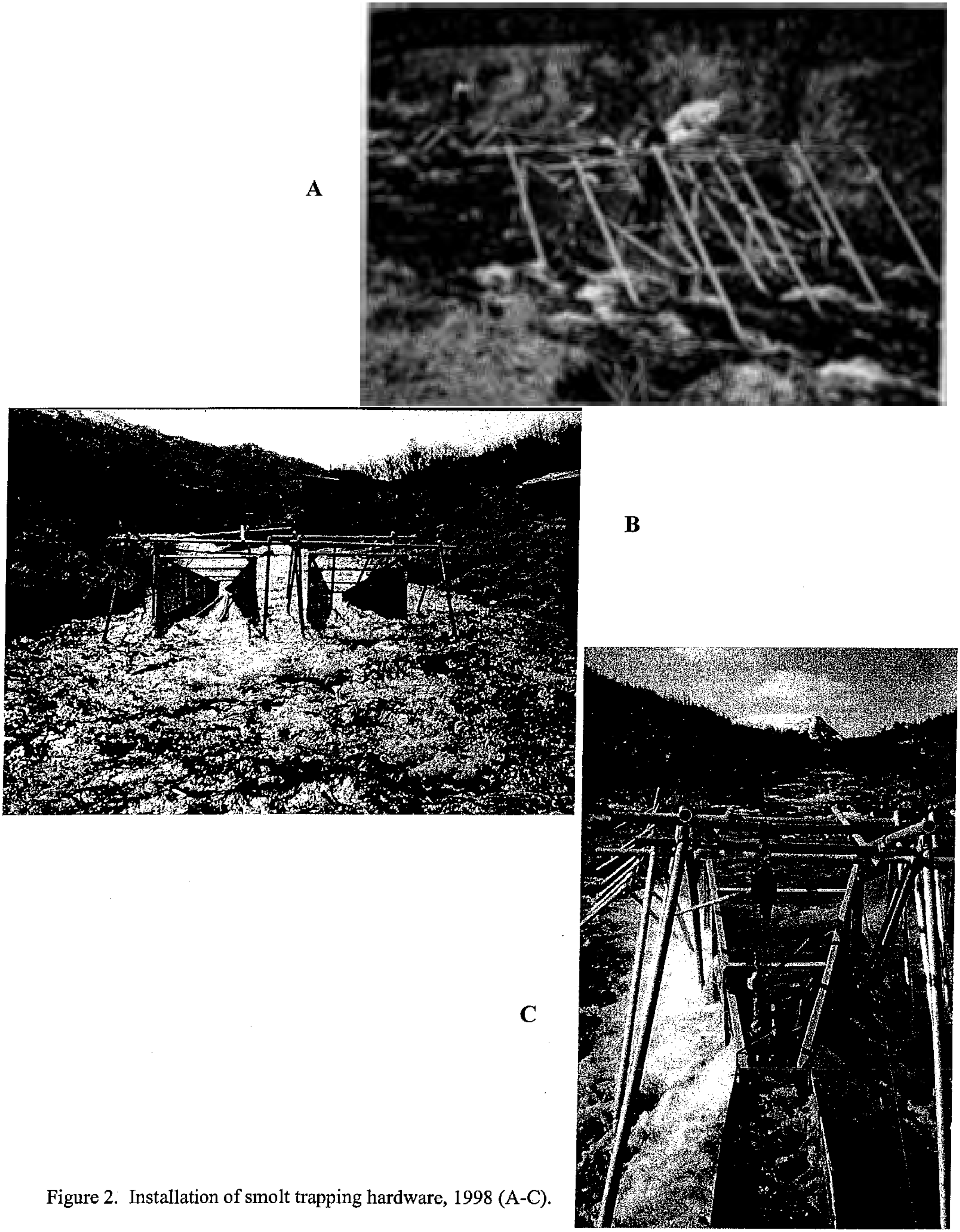


Figure 1. Locations of the ADF&G smolt and adult salmon field camps, Spiridon Lake, Telrod Cove, and Spiridon Bay in the Northwest Kodiak Commercial Fishing District.



A

B

C

Figure 2. Installation of smolt trapping hardware, 1998 (A-C).

Figure 3. Troughs (A), tanks (B), and weir (C), 1998.

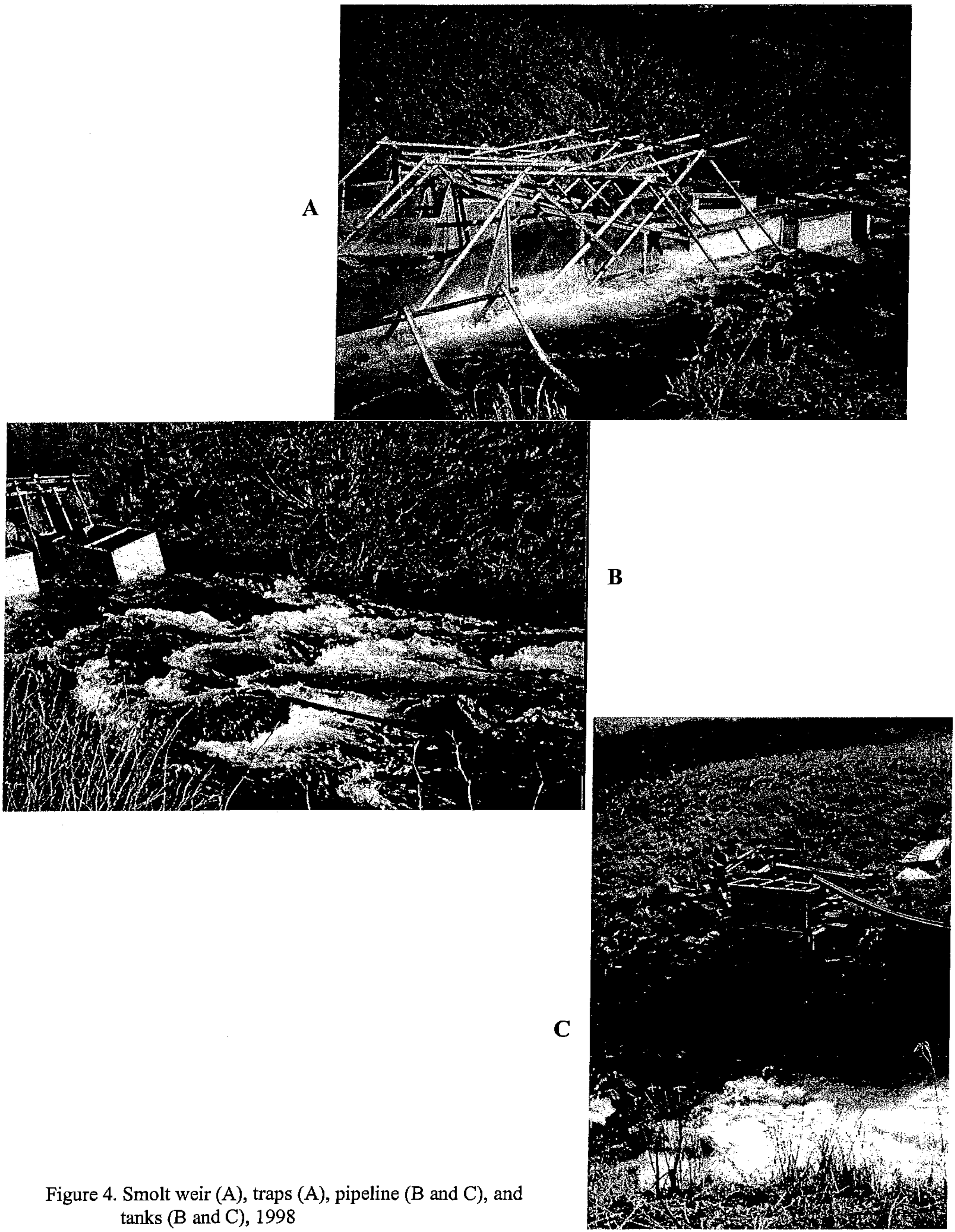


Figure 4. Smolt weir (A), traps (A), pipeline (B and C), and tanks (B and C), 1998

SPIRIDON SMOLT DAILY REPORTING FORM, 2002

Date: 5/10/2002 **EXAMPLE**

Counting		Muliple	Live		Dead		Total	
Period (Military hrs)	Time (Min:Sec)	(30 Min. /Time)	Count	Count x Multiple	Count	Count x Multiple	Estimate Live and Dead	Remarks
2300-2330			352		2		354	hand count
2330-0000	8:00	3.75	653	2,449	3	11	2460	
0000-0030	8:00	3.75	988	3,705	0	0	3705	
0030-0100	6:00	5.00	875	4,375	4	20	4395	
0100-0130	2:00	15.00	888	13,320	3	45	13365	
0130-0200	1:00	30.00	900	27,000	0	0	27000	
0200-0230	1:00	30.00	955	28,650	0	0	28650	
0230-0300	3:00	10.00	1104	11,040	1	10	11050	
0300-0330	8:00	3.75	777	2,914	0	0	2914	
0330-0400	8:00	3.75	479	1,796	0	0	1796	
0400-0430			401		7		408	hand count
0430-0500			345		4		349	hand count
0500-0700			1678		24		1702	hand count
0700-12:00			99		0		99	hand count

Totals:					
Timed Live:	95,249	Timed Dead:	86	Timed Live&Dead:	95,335
Other Live:	2875	Other Dead:	37	Other Live&Dead:	2,912
Total Live:	**98,124**	**Total Dead:**	**123**	**Grand Total:**	**98,247**

Figure 5. Spiridon smolt daily reporting form, 2002.

SPIRIDON SOCKEYE SALMON SMOLT SUMMARY, 2002

EXAMPLE

Date	Timed		Other (hand counts)		Total			Cumulative			Percent Dead	
	Live	Dead	Live	Dead	Live	Dead	Live and Dead	Live	Dead	Live and Dead	Daily	Cum.
9-May	77,664	111	3,215	57	80,879	168	81,047	80,879	168	81,047	0.21%	0.21%
10-May	95,249	86	2,875	37	98,124	123	98,247	179,003	291	179,294	0.13%	0.16%

Figure 6. Spiridon sockeye salmon smolt summary reporting form, 2002.

DAILY PHYSICAL OBSERVATIONS FORM, 2002

PROJECT/ SUB-PROJECT: ________________

YEAR ________________

page_____of_____

DATE	TIME	SITE[1]	TEMPERATURE (C)		CLOUD COVER		VISIBILITY	WIND		GAUGE	COMMENTS (i.e., rain, drizzle, etc...)
			Air	Water	Percent (%)	Ceiling	(mi)	Direction	Vel. (kts)	HEIGHT (cm)	

[1] Weir Site = W; Smolt Site = S

Figure 7. Daily physical observations form, 2002.

Telrod Creek Escapement Surveys Reporting Form, 2002

PAGE ________ OF ______

DATE	NUMBER OF					COMMENTS
	SOCKEYE	"JACKS"	PINKS	COHO	OTHER	

Figure 8. Telrod Creek escapement surveys reporting form, 2002.

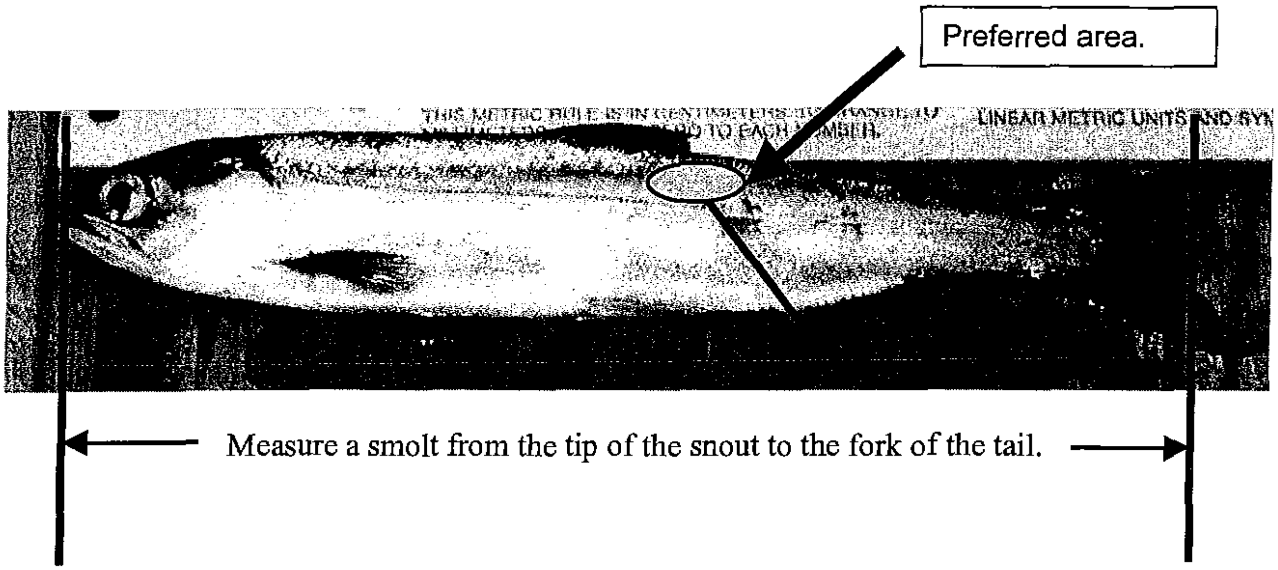
Spiridon Lake Terminal Harvest Area (Telrod Cove) Fishery Monitoring Reporting Form, 2002.

		Estimated Harvest										
	Number	Sockeye		Pinks		Chums		Coho		Chinook		Number scales
Date	of Boats	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative	Daily	Cumulative	Collected
Totals												

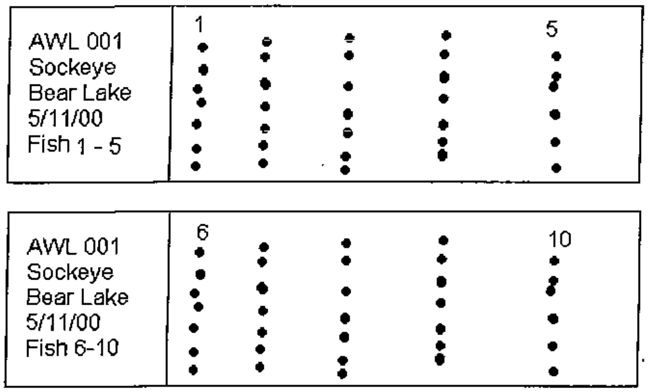
Figure 9. Spiridon Lake Terminal Harvest Area (Telrod Cove) fishery monitoring reporting form, 2002.

APPENDIX

Appendix A.1. Photo of a smolt with the preferred area highlighted.



Appendix A.2. An example of a correctly labeled smolt AWL slide.



When the slides are completed, return them to the box in order by AWL # and fish #, and label the slide box on top with the following information:

Location: Bear Lake
AWL Number: AWL 001-003
Beginning and end dates: 6/12-7/13/00
Sockeye Salmon Smolt

Appendix A.3. Procedure for recording salmon smolt age-weight-length data on AWL forms.

AWL Forms

Smolt length and weight will be recorded on AWL forms (Appendix A.2). Using a no. 2 pencil, complete each section of the left side of the AWL and darken the corresponding blocks:

Description: Include species (sockeye smolt), location, year, and samplers.

Card: The AWL forms and corresponding slides are numbered sequentially by date throughout the season starting with #001. A new, consecutively numbered form is used each day even if the previous card is not completed. There may be a minimum of one fish and a maximum of 40 fish (8 slides) per AWL form.

Species: Refer to the reverse side of the AWL form to obtain species: sockeye = 2.

Day, Month, Year: Use the appropriate digits for the date fish are sampled.

District, Subdistrict, Stream:

Saltery	259	41	415	(adult and smolt)

Period: List the period in which the fish were sampled (refer to Appendix A.5).

Project: Refer to the reverse side of the AWL form to obtain a code; code 8 is the smolt code.

Gear: Refer to the reverse side of the AWL form to obtain a code; 00 = trap.

Mesh: Leave blank.

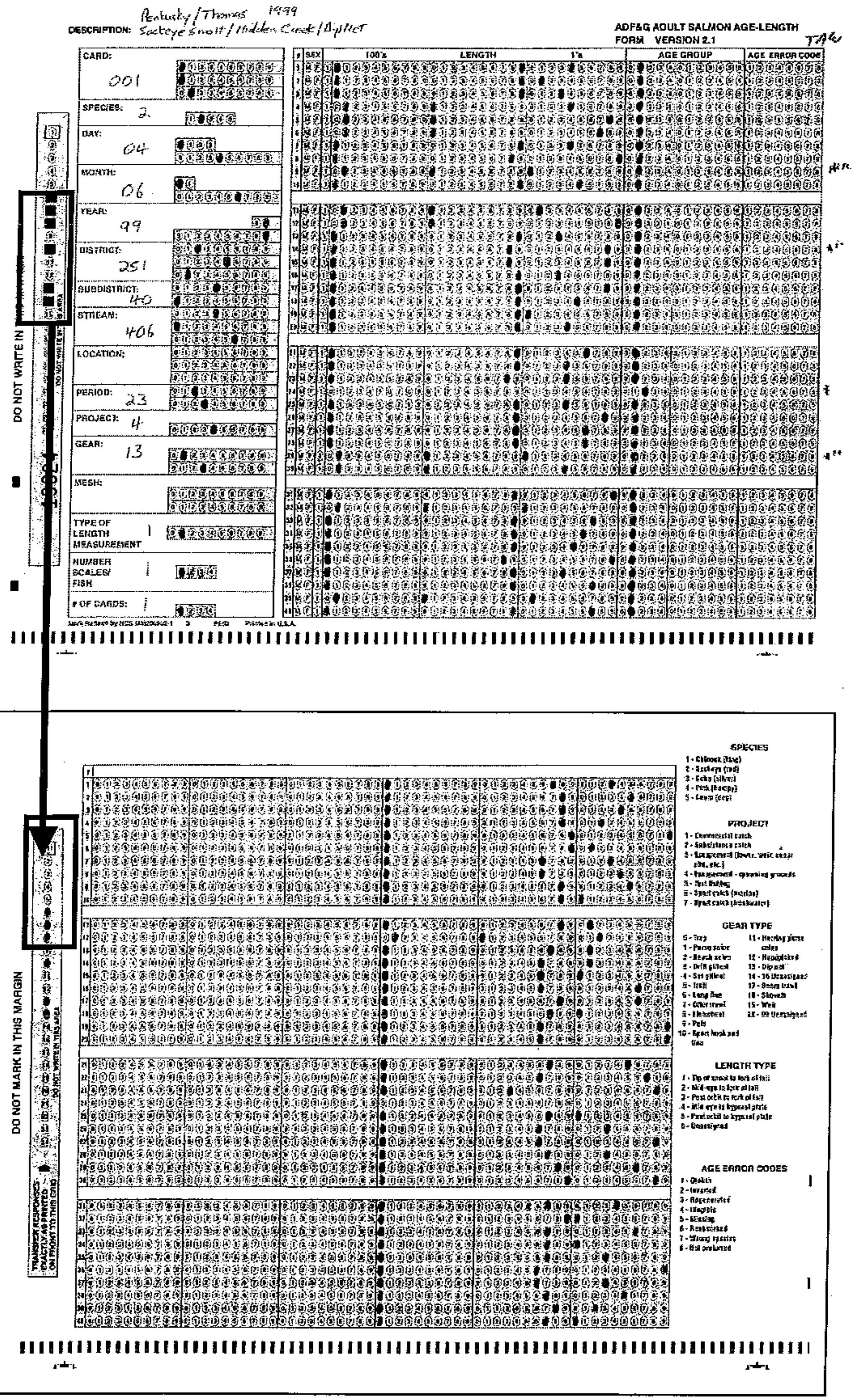
Type of Length Measurement: Refer to the reverse side of the AWL form to obtain a code; Tip of snout to fork of tail = 1 (Appendix A.4).

Number of Scales: Put a number 1 (refers to the column of scales per fish, which is one).

# of Cards: Put a number 1. Keep litho codes in numerical order throughout the season and be sure to transfer the litho code from the front left side to the backside of the AWL form when sampling smolt. These forms will be optically scanned and stray marks may be misinterpreted.

The crew leader is responsible that all forms are carefully edited before returning them to your supervisor.

Appendix A.4. Example of an AWL form filled out for smolt sampled (Note: Project code should be 8 not 4 – the updated form will be available in 2002).



Appendix A.5. Period codes and corresponding dates for the period section on AWL forms.

Period	Dates	Period	Dates
1	01-Jan to 03-Jan	28	05-July to 11-July
2	04-Jan to 10-Jan	29	12-July to 18-July
3	11-Jan to 17-Jan	30	19-July to 25-July
4	18-Jan to 24-Jan	31	26-July to 01-Aug
5	25-Jan to 31-Jan	32	02-Aug to 08-Aug
6	01-Feb to 07-Feb	33	09-Aug to 15-Aug
7	08-Feb to 14-Feb	34	16-Aug to 22-Aug
8	15-Feb to 21-Feb	35	23-Aug to 29-Aug
9	22-Feb to 29-Feb	36	30-Aug to 05-Sep
10	01-Mar to 07-Mar	37	06-Sep to 12-Sep
11	08-Mar to 14-Mar	38	13-Sep to 19-Sep
12	15-Mar to 21-Mar	39	20-Sep to 26-Sep
13	22-Mar to 28-Mar	40	27-Sep to 03-Oct
14	29-Mar to 4-Apr	41	04-Oct to 10-Oct
15	05-Apr to 11-Apr	42	11-Oct to 17-Oct
16	12-Apr to 18-Apr	43	18-Oct to 24-Oct
17	19-Apr to 25-Apr	44	25-Oct to 31-Oct
18	26-Apr to 02-May	45	01-Nov to 07-Nov
19	03-May to 09-May	46	08-Nov to 14-Nov
20	10-May to 16-May	47	15-Nov to 21-Nov
21	17-May to 23-may	48	22-Nov to 28-Nov
22	24-May to 30-May	49	29-Nov to 05-Dec
23	31-May 10 06 June	50	06-Dec to 12-Dec
24	07-June to 13-June	51	13-Dec to 19-Dec
25	14-June to 20-June	52	20-Dec to 26-Dec
26	21-June to 27-June	53	27-Dec to 31-Dec
27	28-June to 04-July		

Appendix B. Example of a weekly report format (Note: delayed mortality tests and variability counts are not part of project operations in 2002).

To: Steve Honnold
A.D.F.&G., Fisheries Biologist
Kodiak, Alaska

Date: 5/30/01

From: Greg Watchers
A.D.F.&G., Fisheries Biologist

Subject: Weekly Report
Spiridon Lake Smolt Project

Smolt Outmigration

As of 5/29/01, a total of 1,092,959 live and 4372 dead smolt have passed through the waterfall bypass system. Averaging over 100,000 smolt/night for the past six nights.

Cumulative mortality is 0.4%.

Some smolt holding in the de-watering tanks.

The second **delayed mortality test** was started on May 25 and ended on May 27. The results of this test were thrown out, due to extremely high mortality rate among the test group. All test smolt were heavily de scaled. During first delayed mortality test all smolt survived.

Have completed two **variability counts**. A third variability count was attempted on May 24. This test was cancelled due the high numbers of smolt moving through the system.

The water temperature has climbed up to 7.0 degrees. Water level has increased to 26 cm.

A.W.L sampling

A total of 949 A.W.L. samples have been collected. On 5/29/00, a sample of 70 smolt had an average weight of 10.0 grams and a length of 108mm.

Anticipated Actives

Continue counting smolt
Conduct more delayed mortality test and variability test.

Appendix C. Project report format.

I. INTRODUCTION

Description of project location.
For example, " Spiridon Lake is located on the westside of Kodiak Island" and " Telrod Creek is long by wide with average depth of...."

History of project

Give a brief history of the project (see Introduction of this plan and regional reports for examples)

Purpose of project

Objectives

Purpose of report

II. METHODS AND MATERIALS

Precisely describe all components of your work that produced the results reported:

Employees

List the employees on site and what periods worked, job classes, and previous time spent on the project.

Weir/traps

Discuss the type of weirs and traps used, installation procedures, dates of use, maintenance schedule, enumeration techniques, estimation techniques, AWL technique, etc.

Monitoring
Describe fishery monitoring duties, such as regulatory marker placement, enforcement, catch estimates, surveys, etc.

Other duties and misc.
Describe the collection of physical data, safety, bear avoidance, camp duties, close up, etc.

This section should follow the operational plan objectives, tasks, and procedures as a guide. Also, include maps, photographs and diagrams if appropriate.

-Continued-

III. RESULTS

Base your results on the objectives and what was accomplished: be specific with dates, numbers, and trends. Address each category listed in the methods section. Simple tables and graphs that summarize the data should be included - include all years if possible for comparison.

IV. DISCUSSION AND RECOMMENDATIONS

Include a discussion of each area of data collection, based on the objectives. Elaborate and assess the results with the focus on assisting with future development and refinement of the project. Include recommendations for modifications such as improving trap locations, weir operations, sampling techniques, camp and support improvements. Also include inventory and equipment/gear lists that will assist with the following years work.

Note: The project biologist (seconday) is responsible for the completion of this report. However, crew members should be included in drafting the document. The report should be started in season with a rough draft of some form submitted to the Project Biologist for comment one week prior to the end of field work. Upon completion of field work, time will be provided to finalize the report. The final version of the report will be written using Word software, with tables and graphs constructed in Excel.